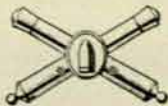


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CONTENTS

Cover—Ninth Army "Watch on the Cologne Plain"

Activities of The Ninth Army AAA. By Colonel John G. Murphy, CAC	2
Artillery Career Field Ready	14
Inspector of Antiaircraft. By Colonel Homer Case, CAC	15
Yokohama AW School, Patterned on AAA School, Fort Bliss	18
Operational Aspects of Guided Missiles. Part III. By Lt. Col. Howard B. Hudiburg, GSC and Lt. Col. Richard G. Thomas, CAC	19
Honor Roll	22
Survey of Japanese AAA. By Seacoast Artillery Research Board	23
Report on AAA Expansion	30
Air Defense of The United States. By Lt. Col. Floyd A. Lambert, USAF	31
States of Readiness, Hq. 74th AAA Brigade	32
Status of Training Literature	33
Career Management For Officers. By Col. J. C. Fry, Cav.	34
Coordinated National Guard—ORC Week-End Training. By Lt. Col. William P. Robinson	43
The Turbo-Jet. By E. S. Thompson	45
Seacoast Service Test Section Notes. By Col. R. E. Dingeman, CAC	53
Defense of A Landing Zone. By Lt. H. W. C. Furman, CAC	55
Flight Beyond The Earth's Atmosphere. By Francis H. Clauser	57
News and Comment	59
Coast Artillery Orders	61
About Our Authors	64

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Using sod camouflage, Battery C, 554th AAA AW Battalion completely dug in its M-15 Half Tracks.

By Colonel John G. Murphy, CAC

NINTH ARMY AAA

Pearl Harbor

The Antiaircraft troops of the Ninth Army (then the Fourth Army with headquarters at the Presidio of San Francisco) were on the alert, defending vital targets with live ammunition in the clips, on the belt, or in the gun pits at the precise time the Japs struck Pearl Harbor on 7 December 1941. Of course, there were a few changes in name, numbers and locale between that time and the day the last German plane was shot down in the ETO; but Pearl Harbor Day had set the pattern of alertness to be followed by the Ninth Army AA units in three and one-half years of war.

The morning of 7 December 1941 found the 37th Coast Artillery Brigade (AA) with Brig. Gen. (now Lieut. General) Le Roy Lutes in command and the 101st Coast Artillery Brigade (AA) commanded by Brig. Gen. D. B. Robinson, in Los Angeles and San Francisco respectively, defending aircraft and shipbuilding plants. These units had started out on a long planned peacetime maneuver to determine solutions to problems encountered in the AA defense of coastal cities where commercial lines instead of field wire had to be used, and where the usual AAAIS and warning did not extend very far. These Brigades were due to roll out of Camp Haan, California about 1 December to their maneuver positions. As the end of November neared, there was increasing concern about the possibility of war with Japan. Maj. Gen. Fulton Q. C. Gardner, in command of the Brigades, Brig. Gen. Wm. O. Ryan, commanding the 4th Pursuit Command and Lt. Col. (later Colonel) J. G. Murphy, Fourth Army AA Officer had several telephone conversations and finally decided that each unit would carry with it one-fifth of a day of fire. This amount seems small now, but those were peacetime days when units going on maneuvers were generally required to submit signed certificates that they had *no* live ammunition on hand. The units defended vital aircraft plants in Los Angeles, shipyards and the Embarcadero in San Francisco and the Naval Base at Mare Island.

Many of the good citizens of San Francisco and Los Angeles believe to this day that the Army knew of the impending attack on Pearl Harbor. Otherwise, they asked, why did you have guns with live ammunition in position and manned day and night? My answer that it was merely a maneuver brought only knowing smiles. Dusk had not fallen on the fateful Sunday, December 7 when AAA units from all over the Country began to roll toward the West Coast to reenforce the defense. The 39th Coast Artillery Brigade (AA) under Brig. Gen. Oliver Spiller was assigned to the defense of Seattle. To Brig. Gen. Charles C. Curtis, commanding the 33d Coast Artillery Brigade (AA), was assigned the task of the antiaircraft defense of San Diego.

At the outbreak of the war, the antiaircraft section of the Fourth Army consisted of four people, the author, Major Clarence E. Rothgeb, Master Sergeant James Wilson and Corporal Max Summers. To help carry the heavy workload entailed by the expanding antiaircraft defenses, it was necessary to bring in some officers from the field on temporary duty. Lt. Cols. Paul Nelson and Bob Clifford and Major Iver Peterson came from General Gardner's staff. Lt. Col. Ted Dayharsh, antiaircraft officer with the III Corps and Lt. Col. Carl B. Wahle from the Fourth Fighter Command also were made available. They all rendered invaluable assistance during that early hectic period.

Antiaircraft Defenses of West Coast after Pearl Harbor

To prevent destruction similar to that which occurred at Pearl Harbor, Gen. J. L. DeWitt, commanding Fourth Army and WDC, advised the War Department that many additional antiaircraft regiments were needed. As they were made available we assigned them to the four brigades at San Diego, Los Angeles, San Francisco and Seattle. Battalions of barrage balloons took the field and added to the defense. Later, smoke companies, with the additional help of smudge pots fresh from the orange groves, were disposed in some vital areas. Initially all antiaircraft units were under the direct command of Fourth Army Headquarters and under

the operational control of the Fourth Fighter Command. After about a month the Fourth Antiaircraft Command was activated with Maj. Gen. F. Q. C. Gardner in command. The four antiaircraft brigades were then assigned to Gen. Gardner's command. Antiaircraft troops in Alaska (then part of Fourth Army and WDC) and the fixed antiaircraft defenses of the harbor defenses remained under control of the Fourth Army and the latter was coordinated with the units of the new antiaircraft command.

During the early days of the war, nerves were on edge and numerous unidentified planes on the board caused many anxious moments. One such plane was flying at high altitude over a city on the West Coast. Air Force, Navy, Marine and civilian representatives all claimed it was not theirs. Finally an order was issued to "scare the pilot by bursting a round near the plane." When this order trickled down to the Lieutenant commanding a 3-inch battery, he sweated over the problem—finally an order to fire reached a gun commander who fired the round set at SAFE.

The Fourth Antiaircraft Command grew and grew until it was the largest antiaircraft command in the United States. At its peak it had a strength of about 45,000 troops. Problems were worked out the hard way. There was little if any guidance from battle experience. They had to learn by trial, error and theory that radars functioned best in a saucer-shaped depression. Central tracer control of machine-gun fire was discarded in favor of individual tracer control. Conditions of readiness were worked out that were later adopted by other organizations. Much of the original work on fighter-searchlight cooperation was done here. The first towers for 40mm guns and M-5 directors were set up by the Fourth AA Command. General Gardner personally visited and passed on the adequacy of every site before a tower was constructed. It was a rare spectacle to see the "Old Man" perched high up on a fire ladder or clinging to a homemade contrivance on the top of a truck—which many a younger man would have hesitated to mount.

Each battery spent many hours camouflaging its installations, and some of the finished products were ingenious. There were many innocent appearing haystacks or tourist camps which suddenly turned into machine guns or nineties when the alert sounded. As there was no enemy action, it was necessary to fire periodic target practices to keep the trained personnel in shape and for training new personnel. Units would be moved out of position—a battery at a time—and proceed to a firing range. Good firing sites were difficult to procure because of fog, air traffic and dense population.

One site surveyed was perfect. There was unlimited firing range, no fog and very sparse population. Our request for the site politely bounced back from Washington many times—each time for a trivial reason. Over three years later when the A-bomb was dropped on Hiroshima the real reason was deduced. One of the Manhattan Project sites was contiguous to our dream site!

Balloons—An Innovation

The introduction of barrage balloons and smoke generating companies brought new problems. The Air Forces objected to the balloons because of danger to aircraft aloft. Unfortunately many of the airfields were close to the vital targets being defended. Household dwellers were fearful that the balloons were a fire hazard. Several of the aircraft manufacturers and utility companies made many protests. Unexpected or violent winds would tear the balloons from their moorings. In soaring away over the cities, the trailing steel cable had a most unfortunate predilection for caressing high voltage power lines with the resultant short circuit causing shutdowns of plants and dark streets and homes. Some of the balloons in San Diego made journeys to Mexico, and the Seattle "runaways" had a penchant for visiting Canada. As the balloons were scarce and valuable, it was customary to make an effort to retrieve them. In those early days anyone who entered Mexico or Canada on official business was authorized to wear an American Theater Ribbon. Ribbons were not as abundant then as later. Of course it was pure coincidence, but it was surprising how many high-ranking officers volunteered to be members of the reconnaissance parties dispatched to Mexico and Canada to search for the lost balloons.

One time a prospector, who lived in a cabin high in the mountains of California, saw a balloon drift down near his cabin. Hidden in his cabin, glancing furtively out of the corner of a window, he thought he was seeing a Jap dirigible. When he saw the word "JAP" printed in big boxcar letters on the front of the balloon, he was certain that the enemy was approaching. After about an hour of anxious waiting, however, no Japs appeared and the only action was the tossing and swaying of the balloon. Finally, the prospector bolstered up his courage, sneaked out of his shack and crept up on the balloon, discovered no occupants and saw that beyond the word "JAP" was printed the word "CATCHER." Some barrage balloon crew had named their balloon "Jap Catcher."

L.A. "Attacked"

There were no enemy air attacks on the West Coast. There were two submarine attacks by gunfire—one on Ft. Stevens, Oregon, and one on some oil docks north of Los Angeles. However there were many alerts, many blackouts, many alarms, and the antiaircraft troops were always in a pertinent condition of readiness. Prior to the battle of Midway there was a distinct tenseness all along the West Coast. We believed the Jap would attack Midway, but we also knew he could change his plans and attack any of the important cities of the West Coast. AA troops during this period were ready for any action. They were always ready for action, albeit sometimes overready or maybe even gullible—as was shown by the famous "Battle of Los Angeles." On Feb 26, 1942, the author was on a Staff visit to the 37th Brigade. Sometime after midnight I was awakened by the sound of gunfire. A quick glance through the window was not productive of any enlightening information. A quick trip to the roof of the hotel brought reward for the upward toil. It was a beautiful moonlight night, but the moon's



40mm Gun of the 430th AAA AW Battalion at Heerlen, Holland, in November 1944.

magnificence was dwarfed by the brilliant glare of nineties and three-inchers spewing fire to the heavens, the glare and noise of the bursting shells, the delicate sky tracery of red and green forty-millimeters and fifty-calibers arching lazily through the skies, and the brilliant incandescence of the searchlights probing the heavens, hither and yon—up and down.

A beautiful picture—a grand show! But at what were they firing? Imagination could have easily disclosed many shapes in the sky in the midst of that weird symphony of noise and color. But cold detachment disclosed no planes of any type in the sky—friendly or enemy. And suddenly all was quiet and only the light of the moon relieved the grim picture of a city in total blackout. I lingered on the roof, ruminated on what it was all about and was idly wondering if I could find my way to brigade headquarters through the blackout when all hell broke loose again. A cacophony of sound and a glaring brilliance again pervaded all! But soon it was over and quiet and darkness again descended on the awakened city. On my way to brigade headquarters next morning, screaming headlines in the morning papers told of the many Jap planes brought down in flames. At brigade headquarters there was much gloom. No one knew exactly what had happened. Maj. Gen. Jacob Fickel and Col. (later Maj. Gen.) Samuel Kepner flew down from San Francisco and with the writer constituted a board to investigate the firing. We interrogated approximately 60 witnesses—civilians, Army, Navy and Air commissioned and enlisted personnel.

Roughly about half the witnesses were sure they saw planes in the sky. One flier vividly described 10 planes in V formation. The other half saw nothing. The elevation operator of an antiaircraft director looking through his scope saw many planes. His azimuth operator looking through a parallel scope on the same instrument did not see any planes. Among the facts developed was that the firing had been ordered by the young Air Force controller on duty at the Fighter Command operations room. Someone reported a balloon in the sky. He of course visualized a German or Japanese zeppelin. Someone tried to explain it was not that kind of balloon, but he was adamant and ordered firing to start (which he had no authority to do). Once the firing started, imagination created all kinds of targets in the sky

and everyone joined in. Well after all these years, the true story can be told. One of the AA Regiments (we still had Regiments) sent up a meteorological balloon about 1:00 A.M. That was the balloon that started all the shooting! When quiet had settled down on the "embattled" City of the Angels, a different regiment, alert and energetic as always, decided some "met" data was needed. Felt it had not done so well in the "battle" and thought a few weather corrections might help. So they sent up a balloon, and hell broke loose again. (Note: Both balloons, as I remember, floated away majestically and safely.) But the inhabitants of Los Angeles felt very happy. They had visual and auricular assurance that they were well protected. And the AA gunners were happy! They had fired more rounds than they would have been authorized to fire in 10 peacetime years' target practices.

Many changes in units and personnel occurred from Dec. 7, 1941 to September 1943 when the Fourth Army no longer had a part in the AA defense of the West Coast. Regiments and battalions were detached and sent on to the islands of the Pacific. New ones were sent in and took up positions vacated by the old outfits. Units were detached and sent to the Aleutians. We furnished the antiaircraft supporting units for the invasion of Attu (actual and bloody) and Kiska (where the cupboard was bare). Many changes occurred among brigade commanders. First to go was Brig. Gen. Le Roy Lutes of the 37th Brigade who went on to bigger and better things. He was followed by Brig. Gen. W. M. Goodman who soon left and acquired a second star. Brig. Gen. Dale Hinman followed and was succeeded by Brig. Gen. Francis Hardaway. Gen. Charles Curtis was transferred from the 33d Brigade and succeeded by Brig. Gen. Jack Colladay from Dutch Harbor. The 39th Brigade had 3 commanders, Brig. Gen. Oliver Spiller, Brig. Gen. Bryan Milburn and Brig. Gen. "Jimmy" Crawford in that order. Gen. Robinson retained command of the 101st Brigade all during this period.

Fourth Army—Now a Field Army

The separation of Fourth Army and Western Defense Command came in September of 1943 and certain personnel from the General and Special Staff Sections of Fourth Army and WDC were assigned as a nucleus of the Army Headquarters. The author, Major A. B. Droke, Chief Warrant Officer Jim Wilson, Sergeants Trumble, Bejesky, Sanucci, and Mitchell from Fourth Army and Lt. Col. (later Col.) Milan G. Weber, Operations Officer of Fourth AA Command were the nucleus of the new AA Section. The new Army CP was at San Jose, California. After a month of shakedown and organization the Fourth Army Hq. moved to Presidio of Monterey with the mission of training all Army Ground Forces units on the West Coast. The duty of the AA section was to coordinate the special training of some AA units that were awaiting shipment overseas.

In January 1944 the headquarters moved to Ft. Sam Houston, Texas, and took over the responsibilities of the Third Army which was preparing to move overseas. The Army had responsibility for the training of, and preparation for overseas movement of all Army Ground Forces units in the southern area. The AA Section concerned itself with the AA units. One of the Fourth Army responsibilities was control of the Louisiana Maneuver Area. To replace the



29th Division Troops examine wreckage of JU52 shot down by 40mm gun with only three rounds.

102d Coast Artillery Brigade (AA) as coordinator of AA activities in the maneuver area, we organized a small anti-aircraft section under Lt. Col. Weber, Executive of the Army AA Section. Many commanders at this time were still not completely sold on the value of anti-aircraft artillery to field forces. Too many commanders considered AA just a source of additional motor vehicles. In the AA phase of the critique held after each maneuver, Col. Weber stressed deficiencies in the use of AA units—especially in river crossings. Later, in the Roer, Rhine, Weser and Elbe crossings, the commanders gave AA high priority without question.

Now Ninth U.S. Army—On the Way!

In May 1944 came the good news—orders to the European Theater. The Fourth Army—for reasons not known—was redesignated as the Eighth Army and in less than a week again was redesignated as Ninth U.S. Army. Rumor was that "Monty" wanted no Eighth Army in Europe except his own famous Eighth. In June, the bulk of the Ninth Army Hq. left the U. S. on the magnificent *Queen Elizabeth* and soon had settled in Bristol, England, for a brief stay prior to crossing the Channel. During this period the AA Section concerned itself with ascertaining the anti-aircraft policies of the

theater, the Twelfth Army Group and the First and Third Armies. The normal scales of assignment and employment within divisions, corps and Armies were determined. Using these policies as a basis, a constant check was maintained concerning the location and status of anti-aircraft units which were scheduled for assignment to the Ninth Army. Though none of these units were assigned until the Ninth Army became operational in France, the plans and preparations were of great help for the future.

Based on the established policies of the Theater and of the Twelfth Army Group, an Anti-aircraft Operations Memorandum was prepared, establishing standard doctrine for all appropriate lower commands within the Army. Plans for training of the anti-aircraft units which were being staged through the United Kingdom were made in conjunction with the 111th AA Group. Officers of the AA Section, which now had grown to 9 officers, 1 chief warrant officer and 26 enlisted men made many trips throughout the United Kingdom on matters of training and coordination; seeking information and learning about doctrines and procedures. Lt. Col. Weber and Capt. Burrell spent several days with the British anti-aircraft forces in the Dover area learning the technique of AA fire against the unpleasant V-1

or "Buzz Bomb." Captain Hollander attended the RAF school of Aircraft Recognition Training and his training there was later reflected in the increased efficiency of the AA troops of the Ninth Army in aircraft recognition. In order to get more intimate data on the functioning of an AA Section with an Army in action, Lt. Col. Weber was sent as an observer with the Third Army AA Section and was with that Army during its spectacular dash across France. On 27 August 1944 when the Army Hq. started to Southampton for the Channel crossing, the AA Section of the Ninth Army had learned the rudiments of its mission and was ready to be of assistance to the many AA units that were later to be assigned to the Operational Army.

France and Belgium—Ninth Army now Operational

The landing on Utah Beach was uneventful! The way had been opened up by the First Army. There was no reception—hostile or friendly. And despite lack of the latter, the large Army Headquarters finally found its way to St. Sauveur du Lendelin, where the forward echelon set up, and beaten-up Perrier where the rear echelon bedded down among the ruins. A week later the whole Army Headquarters were bivouacked in the damp wooded recesses of Mi Foret near Rennes, France. And on September 5, 1944, we attained the goal for which the Army Commander, Lt. Gen. Wm. H. Simpson, had worked assiduously. The Ninth Army was operational—we were part of the team in action—even if only in a small way.

Our mission was the reduction of the Brest Peninsula and protection of the south flank of the Twelfth Army Group along the Loire River as far as Orleans. We picked up our first antiaircraft units—the 113th Group, under Col. Charley Wolf, which was assigned with the VIII Corps. Directly under the group was the 635th AW Bn. The 445th Bn (AW) was with the 8th Division, the 453d AW Bn and 473d SP Bn were assigned to the 83d Division and the 6th Armored Division had the 777th Bn. Col. Wolf's Group and the antiaircraft battalions were seasoned veterans by this time. They had given antiaircraft support to the VIII Corps during its successful push from the beaches and were already credited with shooting down approximately 25 planes. They

were held in high regard by the Corps and Division Commanders. The AA units were used primarily in a ground action and patrolling role, and had expended much ammunition in this role. German air attack was desultory and no enemy planes were engaged during the Brest action. One enlisted man was killed and one officer and seven enlisted men wounded. These were the first Ninth Army casualties among antiaircraft troops. While at Mi Foret, we were joined by the 55th Coast Artillery Brigade (AA) which had been assigned to us previously. The brigade, commanded by Brig. Gen. Samuel L. McCroskey, had seen vigorous action defending the beaches after D-Day. No units were available for assignment to the brigade and its first active operations were conducted later when the Ninth Army had taken up position north of the First Army.

After the reduction of Brest, the Ninth Army was moved north and deployed in the Ardennes area between the First and Third Armies. This area was later the scene of the famous "Bulge" but the Ninth Army AA was then elsewhere. However, the skill and valor of the antiaircraft were gloriously upheld by the antiaircraft units of the First Army. Ninth Army mission was merely to contain the enemy. There was no German air activity, but the battalions available were disposed in defense of some vital installations. Soon orders came for the Ninth Army to turn over the Ardennes area to the First Army, move to Holland and prepare for operations on the left flank of the First Army. This necessitated coordination with Col. C. G. Patterson, Antiaircraft Officer of First Army, in order to effect continuous antiaircraft defense in Holland and Belgium in which there would otherwise have been a gap because of the shift in responsibility and exchange of antiaircraft units.

Holland—Start of Antiaircraft Activity

On 22 October, the Ninth Army moved north and took up position between the British 21 Army Group and the First U.S. Army. Army Hq. was at Maastricht, Holland. Here started the real activities of the AA units of the Ninth Army. From early November when the first Category I (enemy plane shot down and seen to crash) was awarded, enemy aerial activity was continuous. Until the Battle of

RECORD OF CONFIRMED CLAIMS

Unit	Cat. I Awards	Cat. II Awards	Unit	Cat. I Awards	Cat. II Awards	Unit	Cat. I Awards	Cat. II Awards
124th Gun Bn	8	10	571st AW Bn (SP)*	4	3	548th AW Bn (M)*	15½	9
127th Gun Bn	3	3	379th AW Bn (M)	1	0	552d AW Bn (M)*	14	5
131st Gun Bn*	6	1	430th AW Bn (M)*	31⅓	20½	553d AW Bn (M)*	8⅓	8
132d Gun Bn*	24⅓	9	440th AW Bn (M)*	½	2	554th AW Bn (M)*	17½	14
135th Gun Bn	5	1	445th AW Bn (M)	10	0	555th AW Bn (M)	2	5½
141st Gun Bn*	6	1	446th AW Bn (M)*	1⅓	1	556th AW Bn (M)*	13⅓	9
749th Gun Bn*	2½	2	448th AW Bn (M)*	3	1	557th AW Bn (M)*	22⅓	15
195th AW Bn (SP)*	13	5	453d AW Bn (M)*	16	10	559th AW Bn (M)*	28	20
203d AW Bn (SP)	1	1	459th AW Bn (M)*	10	3	562d AW Bn (M)	4	7
387th AW Bn (SP)*	29	14	531st AW Bn (M)	26	13	Non-AA Units*	11	2
473d AW Bn (SP)	14	13	547th AW Bn (M)	1	1	TOTAL	352½**	209

*Indicates same awards were shared with contiguous battalions.

**Shared with First Army.

NOTE: Ninth Army claims do not include confirmations received while units were under other commands. (Ed.)

AAA UNITS ASSIGNED TO NINTH ARMY AT VARIOUS TIMES

55th AAA Brigade (McCroskey) (Schabacker)	749th AAA Gun Bn (SM) (Weis) (less Btys A & B)	597th AAA AW Bn (Winters)
Groups	AAA AW Battalions	567th AAA AW Bn (Foster)
2d AAA Group (Pierce)	379th AAA AW Bn (Cron)	462d AAA AW Bn (Stultz)
12th AAA Group (Bailey)	430th AAA AW Bn (Mercondino)	446th AAA AW Bn (Race)
18th AAA Group (Munford)	438th AAA AW Bn (Lane)	798th AAA AW Bn (Ledeboer)
19th AAA Group (Spalding)	440th AAA AW Bn (Stone)	635th AAA AW Bn (Wangeman)
26th AAA Group (Steward)	445th AAA AW Bn (Graw)	777th AAA AW Bn (Twyman)
31st AAA Group (Scott)	448th AAA AW Bn (Eason)	AAA SP Battalions
34th AAA Group (Bray)	453d AAA AW Bn (Trousedale)	195th AAA AW Bn (SP) (Corum)
38th AAA Group (Duncan)	459th AAA AW Bn (Parrish)	203d AAA AW Bn (SP) (McFarland)
103d AAA Group (Myrah)	463d AAA AW Bn (McCormack)	387th AAA AW Bn (SP) (Kenneweg)
113th AAA Group (Wolf)	531st AAA AW Bn (Mace)	473d AAA AW Bn (SP) (Gifford)
AAA Gun Battalions	547th AAA AW Bn (Stillman)	482d AAA AW Bn (SP) (Lupinacci)
124th AAA Gun Bn (Laney)	548th AAA AW Bn (Oliver)	571st AAA AW Bn (SP) (Hunter)
127th AAA Gun Bn (Reynolds)	552d AAA AW Bn (Warfield)	573d AAA AW Bn (SP) (Welsh)
131st AAA Gun Bn (Arends)	553d AAA AW Bn (Wells)	572d AAA AW Bn (SP) (Hattox)
132d AAA Gun Bn (Boyce)	554th AAA AW Bn (Linderer)	778th AAA AW Bn (SP) (Arthur)
134th AAA Gun Bn (Hunt)	555th AAA AW Bn (Farnham)	796th AAA AW Bn (SP) (Williams)
135th AAA Gun Bn (Smith)	556th AAA AW Bn (Efford)	S/L and Operations Units
141st AAA Gun Bn (Knapp)	557th AAA AW Bn (Groff)	Btry A, 226th SL Bn (Fiendal)
142d AAA Gun Bn (Kallman)	559th AAA AW Bn (Baker)	Btry B, 357th SL Bn (Flannigan)
	562d AAA AW Bn (Israel)	154th AA Opns Det (Cox)

the Bulge in December, most of the activity was night reconnaissance, some bombing of our front lines, and an occasional bomb in Maastricht to notify us that our presence was known. The AA units of the divisions, corps and Army were ever alert and kept the Luftwaffe planes high in the sky, fired many rounds and although the number of German planes destroyed was not impressive, the AA units were getting training that later produced results.

The 55th Brigade became operational with three groups and was given the mission of defending the Army area from the Corps boundaries to the Army rear boundaries. This mission was assumed by the 2d AA Group, commanded by Col. Harry R. Pierce, the 26th AA Group, commanded by Col. Wilfred H. Steward, and Col. Duncan's 38th Group. With the XIX Corps we had the 12th AA (Apple) Group commanded by Col. Don Bailey. This group and the battalions we inherited with it were hard-bitten veterans by now and had proved their worth in many heavy air attacks. They were already credited by the First Army with shooting down approximately 50 German planes. With the XIII Corps we had Col. A. C. (Spud) Spalding's "High Hat" 19th AA Group, which had been on the Continent for some time and "knew its way around." The 29th Tactical Air Command under Brig. Gen. (now Maj. Gen.) Richard E. Nugent had been assigned to support the Ninth Army. The 154th Operations Detachment of the 55th Brigade moved right in with the 29th TAC and set up an efficient air warning system for the AA units with the Army.

In November 1944, buzz bombs (V-1) soared over the Ninth Army area with increasing frequency—averaging 50 to 60 a day. Due to faulty mechanism many fell and exploded in Maastricht. The Germans had previously ranged in on Maastricht and Liege, and because of the increasing Army installations in the Maastricht area and the bridges over the Maas River, vital to the supply of the forward units,

it was thought the city and environs might become a primary target for V-1's. In order to be prepared for such eventuality Gen. McCroskey was requested to submit a plan for an antidiver belt. His plan called for a two-gun battalion defense about 7 miles southeast of Maastricht. It was based on the probable direction of flight of the missiles and also the fact that, due to uncertainty as to whether the bomb would explode in the air when hit or do some fancy gyration and land almost any place, it was necessary to assure that the explosion would not occur in the vicinity of the vital Army installations. If the gun belt were moved too far from the defended objects, fewer V-1's could be engaged due to the narrowing of the approach "funnel." Seven miles seemed to be the optimum distance. One gun battalion was deployed on the gun belt but no V-1's were engaged. Our plan was overtaken by events and the battalions that were to be used in the diver belt were needed elsewhere after the Germans began to break through in the Ardennes. Brussels and Antwerp continued to be the target for the V-1's and V-2's.

G.A.F. Active

From December 16 to 18 the German Air Force stepped up its activities for the purpose of preventing Ninth Army reinforcement of the Bulge. Bombing, strafing and reconnaissance took place all over the area. Of four hundred planes over the Army area in 2 days, 80 were destroyed or damaged. One plane containing 40 paratroopers was shot down. Pozit fuses were used for the first time during this period.

New Year's Day and Eve will long be remembered by the anti-aircraft gunners of the Ninth Army. In a 48-hour period 260 planes were over the Army area. Harassing raids by single planes, bombing, and strafing, started at dark New Year's Eve and continued during the night. New Year's morning a gigantic raid was projected along the whole front.

The objective was to wipe out British and American airfields and planes in the rear areas. Before the last AA gun had ceased firing, antiaircraft units of the Ninth Army had knocked down 90 German planes.

The Ninth Army had been poised on the Roer River for several months. The crossing had been delayed by the Battle of the Bulge. Further delay was occasioned by fear of the floodwaters that the Germans planned to release by opening the control tunnels of the Roer Dams. The Air Force had unsuccessfully tried to knock the dams out by intensive bombing and the many determined attacks by the First Army to capture the dams failed. The waters were finally loosed by the Germans but by Feb. 23, 1945 the flood had subsided and the Ninth Army attacked across the Roer, made a brilliant turning movement to the north, captured München-Gladbeck, the largest German city yet captured, and soon had cleared all enemy resistance in its zone between the Roer and the Rhine. It was felt that the impetus of the drive could have been continued across the Rhine. The plan to do this was vetoed by Field Marshal Montgomery of the British 21 Army Group under which the Ninth Army had been operating since the Battle of the Bulge. There was considerable German air activity during the first 2 days of the Roer crossing. Approximately 90 planes attacked on the 23d and 60 planes on the 24th. No damage was inflicted on any of the bridges.

Across the Rhine—the Weser—the Elbe

The original plans of the Supreme Commander called for the Ninth Army to cross the Rhine in conjunction with the British and make the drive on Berlin. The Third Army was to make a crossing near Coblenz and the First Army remain west of the Rhine. Man proposes but sometimes does not wait for Divine disposition. The First Army exploited the Remagen bridge and crossed the Rhine early in March. Our northern crossing was planned for March 24 and "Monty," ever the perfectionist, refused to advance the crossing date. This crossing was still of vital importance however. The route through northern Germany was still the quickest route to Berlin and was a necessary concomitant of the ensuing brilliant double envelopment of the Ruhr by the First and Ninth Armies. From the way the German Air Force had reacted to our Roer crossing, it was felt they would use everything available to disrupt the crossing of the Rhine.

Previously, the Ninth Army had acquired the XVI Corps and for assignment to that Corps we selected, from among several Groups offered by First Army, the 18th AA Group commanded by Col. Tom Munford. As the XVI Corps was to make the main crossing, Col. Munford was charged with the antiaircraft defense of the crossing. It was decided to develop as impregnable a defense as possible with the units available. The bulk of the antiaircraft was massed in the zone of the assaulting XVI Corps. The immediate defense consisted of 2 groups, 4 gun battalions, 10 automatic battalions, one searchlight battery and a British squadron of light barrage balloons. This defense was extended in width and depth by the antiaircraft battalions of the 55th Brigade which was defending the bridge at Venlo, Army dumps of vital bridging material, fake dumps and other Army installations.

These battalions had selected tentative map positions on the far side of the river and were ready to cross on two hours' notice. The attack jumped off at 0200 on March 24 in the vicinity of Wesel. The 17th Airborne Division was to make a drop north and east of Wesel. Orders had been issued that absolutely no antiaircraft firing would take place during the transit of the airborne division to its dropping areas. The prohibited period was 0800 to 1000 and firing after the latter hour was to be only on direct order from Army Headquarters. Any enemy attack was to be opposed by our own air forces. The friendly planes passed over safely, the drop was made and the planes returned. At approximately 1000 the restriction was removed.

Rhine Crossing

As each assaulting division crossed the Rhine and secured a bridgehead, its attached antiaircraft followed in the trace of the divisional artillery and took up positions for AA support on the other side. As these battalions followed their fast moving divisions, the previously alerted brigade units crossed and set up the AA defense on the east bank of the river. The whole action was a fast moving one and by the third day, the 18th Group had moved on with the XVI Corps and Gen. Schabacher took over the defense of the crossing with his 55th Brigade and attached units. The German air reaction to the crossing did not occur until the afternoon of the first day when approximately 40 planes attacked. On the second and third days, 75 and 85 planes attacked.

No damage was inflicted and 30 planes were destroyed or damaged. As the Army advanced rapidly eastward from the Rhine, the AA units continued to support the movement. In addition to daily desultory attacks, there were three final efforts made by the German Air Force. During the closure of the Ruhr pocket on 1 April an attack of 30 German planes was repulsed. When the Weser River was crossed on 5 April about 55 planes attacked; and the final greeting of the Luftwaffe was at the crossing of the Elbe River when, during a period of 4 days, there were 250 attacks. It was the swan song of the Luftwaffe in the zone of the Ninth Army.

It is interesting to note that the German Air Force reacted each time a river was crossed or a tactical advance attempted.

When the Elbe was reached, the war was over for the antiaircraft units of the Ninth Army. The road to Berlin was wide open and the broad Autobahn offered an inviting artery to Unter Den Linden. But someone in the upper realms decreed otherwise. The Russians were to take Berlin! So our antiaircraft units turned to military government with the same steadfastness and cheerfulness that had guided their combat efforts. They had done a fine job! They had prevented the German Air Force from inflicting any significant damage on the Ninth Army. They had shot down or badly damaged 561 German planes. By ground fire they had materially aided the ground operations of the Ninth Army. Like all other troops, they were now ready to go home.

Antiaircraft Units In Other Roles

In addition to the foregoing narrative, it is felt that some observations should be added on the other activities of AA units, the functioning of matériel and ammunition, training and other matters deemed of general interest. Although the

The Stars and Stripes European Theater of Operations Sunday, February 4, 1945

45 Downed in 45 Minutes is XIX AAA Score

WITH XIX CORPS—In a space of 45 minutes, 45 German planes were destroyed or probably destroyed by antiaircraft artillery units of the XIX Corps it was revealed at Corps headquarters. The action took place New Year's Day—the day the Luftwaffe bombed Brussels.

Sixty-four enemy planes—the largest concentration of hostile aircraft at any one time over the corps area—were framed in the director scopes and forward area sights of the ack-ack outfits.

Of the 45 planes listed, Ninth Army Hq. has officially confirmed 32 as definitely destroyed. The other 13 are reported as probables.

Practically every AAA automatic weapon in the corps was in action that day—the day of the greatest Luftwaffe strike on the Continent since D-Day. German planes, mostly FW190s and ME109s, appeared at altitudes varying from 200 to 2,000 feet starting at 0900 hours. At one time, from a high point near the Corps CP, five columns of black smoke were observed in the vicinity of the Hurtgen Forest.

One Round—One Plane

In one operation, a 40mm Bofors gun of the 445th AAA (AW) Bn., located in a small clearing in the forest, was only able to fire one round at a FW190 because of the tree masks around the position.

The round burst squarely under the fuselage and set the plane on fire. The plane crashed in flames less than a mile away.

The AAA battalions are units of the 12th AAA Group under command of Col. Donald J. Bailey.

High scorer for the day's operation was the 552d (AW) Bn. with 10 planes definitely destroyed and three probables. The 445th brought down seven definites.

The 430th AW Bn., 459th AW Bn., 571st AW Bn. (SP) and 132d Gun Bn. were each credited with a number of kills.

(b) Support of Infantry in attack (AW's mobile and and S.P.).

(c) Assault on field fortifications (guns and all types of automatic weapons).

(d) Rear guard action, including defense of road blocks (AW's mobile and S.P.).

(e) River line patrolling (AW's mobile and S.P.).

(f) Antimechanized defense (guns and all types of automatic weapons).

(g) Antiparatroop defense (organized under group commanders and included AA troops and available service troops).

(h) Convoy protection (AW's mobile and S.P.).

(i) Defense of river crossings (included defense against saboteurs, waterborne or ground attack).

(j) Mopping up operations (AW's mobile and S.P.).

(k) Battlefield illumination, movement light, and illumination for special projects such as bridge building, clearing mine fields, etc.

The use of searchlights in the zone of action for purposes other than illuminating targets for automatic weapons is of interest. Hearing that the British on our left were experimenting with searchlights, we observed their results and decided to experiment. The first reaction from division commanders was a howl of protest. The combat soldiers declared they felt naked—and were certain they stood out as targets for the Germans. However, in the Corps zones the "artificial moonlight" was an instant success. Convoys and individual vehicles could move swiftly and safely. Soon some division commanders were requesting illumination for their division zones and the supply of searchlights never was equal to the demand. The Germans did not like them at all! Properly used they could illuminate the German positions, while our own troops, keeping in the shadows, could not be seen. The German artillery expended considerable ammunition in an effort to knock out the lights but, as they were always emplaced with defilade, only one was lost.

Another type of non-AA activity was the participation by AA units in the logistic support of other units of the Army. There were never sufficient service truck companies to satisfy the logistic needs of fast moving Army troops. All anti-aircraft battalions had organized provisional truck companies. When Army G-4 felt he needed assistance, arrangements were made to supply as many of these provisional truck companies as were needed—or depending on the tactical situation—could be spared. They were a valuable adjunct that could be counted on in critical phases.

Firing at Friendly Aircraft

The problem of preventing firing at friendly planes is a difficult one to solve and must be constantly studied to insure the best solution. There had been many friendly planes fired at, and some destroyed, along the front of the Twelfth Army Group. In many cases it was retaliatory firing at friendly planes bombing our own troops. We decided to try to eliminate such incidents in the Ninth Army zone.

Strict orders were issued to all antiaircraft troops (and nonantiaircraft troops armed with AA weapons) that *no* friendly planes *be* fired upon under any circumstances, regardless of commission of hostile acts by these planes. Back

military mind has been often criticized as a "past war" mentality, it is nevertheless true that a study of the past is invariably necessary in the preparation of future plans. The "eclipse" of antiaircraft artillery predicted after the last war has not occurred. It is more important today than ever before and if a war were to occur now, it would be necessary to employ substantially the same devices used in the past war. Guided missiles and push-button rockets, when available for use, will merely be the new instruments of defense which our AA units will employ.

A secondary, but important role of antiaircraft units of the Ninth Army was participation in ground action—offense or defense.

Ninth Army AA units were utilized almost continuously in a variety of ground roles and any attempt to present a detailed account herein would be impracticable. Antiaircraft units were utilized in the following types of ground operations:

(a) Reinforcement of Field Artillery by 90mm guns (including counterbattery, interdiction, counterflak, harassing, neutralization and destruction).

AW With the 29th Infantry Division

One distinct feature of my battalion was its break in the conventional use of AW attachment to field artillery battalions. Instead, we used as area defense, one gun in every 1000 meter grid with the grids containing the field artillery receiving first priority. This type of AA defense placed my men in close contact with other elements of the division, such as infantry and engineers. Frequently in an area defense, my men were preparing position in close proximity to or on the MLR and the infantry liked to see us. In addition, my men enjoyed an opportunity to get in a little direct fire on the Krauts.

The 554th AAA AW Bn (Mbl) was composed of 32 40mm gun sections with the water cooled .50 cal. machine gun, plus 16 M16 half tracks. This equipment I used as 48 individual gun sections as an AA area defense with telling effect.

On New Year's Day, 1945, my battalion shot down six German planes in less than ten minutes, two of which I personally witnessed crashing in flames less than 2000 yards from my headquarters battery kitchen.

—Lieutenant Colonel Lawrence A. Linderer.

of these orders was the visualization that friendly pilots would occasionally get disoriented, make mistakes and attack friendly installations. Two "wrongs" do not make a "right"—so to shoot down the offending plane was not the solution. We advised the 29th TAC, whose pilots flew in our zone, that our strict enforcement *must* be paralleled by a simultaneous effort on their part to avoid such attacks on friendly troops.

We found that many pilots did not know that yellow smoke represented friendly ground forces. We also discovered some AA units did not have yellow smoke pots or those they did have were not quickly available. We printed and had pasted on every gun, the rules of antiaircraft engagement. We stressed as a principal rule that each fire unit commander had to make his own decision as to opening fire. Too many fire units were prone to indiscriminately "join in" the shooting started by another unit. We continuously stressed aircraft recognition. The effort was successful! At the end of hostilities, Gen. Nugent, commanding 29th TAC, wrote a letter of appreciation stating that the morale of his fighter pilots had been greatly enhanced by the knowledge that they were not in danger of being fired at by friendly antiaircraft artillery.

Matériel

A war in the near future would involve the use, initially at least, of the same antiaircraft matériel used in World War II. So a few observations on this subject may be in order.

The 90mm gun functioned well at all times except for the power rammers. After less than two months' use, all gun battalion commanders requested their removal. They were erratic in action, presented an additional maintenance problem due to overloading the equilibrators, and were the cause of personnel injuries. After removal, firing was more uniform, equally rapid and safer. Emplacements of the nineties presented a problem. In the Corps zone of action particularly, it was necessary to dig them in so as to afford reasonable protection against artillery fire. In hard ground three days were sometimes required to dig an emplacement with the tools available. The problem was solved by borrowing

bulldozers from near-by Engineer units. Digging was then a matter of hours only.

The 40mm Bofors functioned well. We discarded all M-5 Directors. They just were not practicable in a combat zone. The mobility of these 40's without the directors was satisfactory. One AW battalion assigned to an Armored Division was able to keep pace in a very mobile situation. The Forward Area, Stiffkey Stick and the Weiss Sight were the sights used and the latter two gave reasonable results. There was felt a great need, however, especially during night action, for an on carriage radar-visual sight with computing mechanism.

Some of the units we inherited from the First Army were equipped with the so-called modified M-16's or "Wasps." These were a vast improvement over the M-51's. One battalion mounted the M-51's on 2½-ton trucks and the results were good. It was not deemed practicable however to immobilize many 2½-ton trucks and requests from other units to mount the M-51's were disapproved. Some units used the M-51's as issued. In retrospect, it can be said that all .50 caliber matériel was very useful.

The M-7 and M-9 Directors in use gave excellent results and with proper maintenance lost very little time from action. The SCR 584 was used in all firings. In most cases, the height finders had been turned in to an Ordnance Depot. From a technical viewpoint, the RC-184 was satisfactory. Its tactical success however was effected by the reluctance of individual friendly aircraft to use their IFF and battery commanders had to rely on AAOR identification.

Analysis of results of the 5,200 rounds of POZIT fused 90mm fired by Ninth Army was insufficient to warrant any definite conclusions but certain tentative opinions were formed. On many occasions, numerous bursts occurred in close proximity to the target without noticeable effect. It might be assumed therefore that the bursting charge in the projectile is not sufficiently strong to be lethal at the maximum distance, from the plane, at which the fuse is activated. In order to assure positive safety to our troops in front, we set 350 mils as the minimum elevation at which POZIT would be fired. Since it was necessary to engage enemy planes below this elevation on numerous occasions, units had to substitute time fuses. The magnitude of enemy air effort did not warrant our troops taking any unnecessary risks.

There were numerous casualties among our divisional troops from 40mm fire at aircraft caused by the malfunctioning of the self-destroying element in the shell. The time of flight varied from 6 to 20 seconds, even in ammunition with the same lot and code number. To protect the front-line troops it was necessary to set a minimum elevation for firing, which created a distinct handicap for units engaging very low flying planes.

Training

Many of the units assigned, which had not had previous combat experience, did not function efficiently at the outset. Among the deficiencies was lack of technical familiarity with some of their equipment, incomplete aircraft recognition training, unsatisfactory mine field discipline and inability to live in the field under combat conditions. It was necessary and desirable to continue training during combat operations. For technical training in the use of AA matériel, teams of

experts, made available by higher echelons, visited most of the units in the field with beneficial results. Army, brigade and group representatives kept in close contact with the firing battalions. There were many periods when AA units, attached to divisions, corps and armies, would remain in positions for an extended time, during which periods the normal alert had to be continued. As a consequence, it was not practicable to assemble the personnel at one location for battery or higher level training. However when the digging in of positions was completed, personnel did have time for some on-site training.

The orthodox training literature is not designed for such training, is usually too technical for the average gunner and the distribution is not sufficiently wide. As a solution, the Ninth Army published a series of mimeographed AA Training Notes—each edition covering a different pertinent subject. They were easily understandable, instructive, and most of the “punch” and interest was produced by illustrative cartoons turned out by Sergeant Dring of the AA Section. These Notes were well received in the field and made substantial contribution to individual training. The special addition on the “Weiss Sight” achieved notable success. This device, which had not been at all favorably received and was much less popular than the Stiffkey Stick, soon was a potent contributing factor in shooting down enemy planes. Weiss Sight equipped units soon were accounting for a high percentage of kills. Brig. Gen. Paul B. Kelly, AA Officer of the Seventh Army wrote a letter requesting 100 copies of the pamphlet. He stated he would like to see a copy in the hands of every 40mm gunner in the Seventh Army.

Training in mine detection and discipline was also improved. AA units were not mine conscious, had very little knowledge of, or confidence in the SCR 625 Mine Detector. Twenty-eight and four-tenths per cent of all antiaircraft casualties were due to mines and booby traps. Automatic weapons units were particularly subjected to the threat of uncleared mine fields.

Results of Ninth Army Antiaircraft Action

During the period from 22 October 1944 to 9 May 1945, a total of 2,728 enemy aircraft were engaged by Ninth Army AA units. When an enemy plane was shot down or so damaged that it probably could not return to its base, the responsible unit made a claim for a Category I or Category II credit or award. These had to be investigated by successive higher echelons to determine validity of the claims, to differentiate between conflicting claims of different units, and

by avoiding duplicate awarding of claims, preserve a true picture of enemy planes actually shot down. In addition to the SWASTIKA authorized to be painted on each gun for planes destroyed, the Ninth Army awarded a highly decorative certificate which was highly prized and prominently displayed by the recipients. The results of the above 2,728 engagements in terms of claims reported, processed and confirmed are as follows:

Number of Claims Initially Reported		Number of Claims Processed by Ninth Army AA Section		Number of Claims Confirmed	
CAT. I	CAT. II	CAT. I	CAT. II	CAT. I	CAT. II
516	299	496	165	352½*	209

The accompanying table gives the breakdown by units credited with destroying or damaging the 561 enemy planes.

Probably, the most important item of interest with regard to enemy aircraft destroyed, or probably destroyed, is the amount of ammunition expended. The attached chart shows by type the ammunition expended in destroying or damaging 561 enemy planes. In addition it includes the actual expenditure of ammunition per gun per day in anti-aircraft and ground roles for comparison with the theater unit of fire and day of supply. It is of interest to note that for each confirmed Cat. I or Cat. II, the Ninth Army expended 33.3 rounds of 90mm, 189.6 rounds of 40mm, 40.9 rounds of 37mm and 5,022 rounds of .50 Cal. ammunition.

This reasonably economical expenditure for the results obtained was favored by some quick “kills.” On Jan. 1, 1945, the 553d AW Bn shot down an FW 190 over Maas-tricht, Holland with 5 rounds of 40mm. The 552d AW Bn brought down two FW190's near Rotgen, Germany on December 23, 1944. The first plane succumbed to 5 rounds of 40mm and approximately 50 rounds of .50 caliber. The second plane cost only five rounds of 40mm. On December 17, 1944 near Alderhaven, Germany the 554th AW Bn shot down a JU 52 loaded with paratroopers after firing only 4 rounds of 40mm; and ten days later near Fronhaven, Germany destroyed an Me109 with 2 rounds of 40mm and one burst of 10 rounds of .50 caliber. But the 445th AW Bn established an unbeatable record. On Jan. 1, 1945, gun section number 1 of Btry C was able to get off only one round at an FW190 that crossed its limited field of fire at high speed. That round hit the fuselage behind the cockpit and the plane crashed.

*Shared with First Army.

AMMUNITION EXPENDITURE

	90mm	40mm	37mm	.50 Cal.
Number of Guns	104	672	192	3,812
Total Number of Rounds expended in AA Role	18,700	106,578	22,994	2,822,376
Average Number of Rounds per plane engaged	6.9	39.	8.4	1,034.6
Number of Gun Days	19,504	79,300	18,976	430,176
Average Number of Rounds per day in AA role	.96	1.34	1.21	6.6
Total Number of Rounds expended in non-AA role	18,859	7,795	555	454,325
Average Number of Rounds per day in non-AA role	.97	.098	.029	1.06
Average Number of Rounds per day, all roles	1.93	1.44	1.24	7.66
Theater Day of Supply, Rounds per gun per day	6	8	8	25
Theater Unit of Fire, Rounds per gun per day	25	30	30	95

Appreciation

Any account of the antiaircraft activities of the Ninth Army or any other Army is the story of the AA units therein—the brigades, groups, battalions, batteries—even the lonely single fire unit grimly alert in some snow-covered or rain-swept field. It is the saga of their unit commanders, the officers and the men who serve the guns, operate the instruments, drive the trucks and tractors, cook the food and keep the records. It is a story of planning, training, firing, waiting, and some dying. Specifically, in the Ninth Army, it is the story of the 55th Brigade and Generals McCroskey and Schabacher and their fine assistants in the Brigade Headquarters. It is the story of the three Groups that operated with the brigade. The 2d Group under Col. Pierce, the 26th Group under Col. Steward and the 38th Group under Col. Duncan—and the staffs of these groups. All produced fine results. It is also the story of the 12th Group under Col. Don Bailey operating with the XIX Corps, of Col. Spalding's 19th Group with the XIII Corps and for a shorter period the story of Col. Munford's 18th Group with the XVI Corps. All had outstanding commanders and staffs. And the groups that operated with the Ninth Army for periods of less duration such as Col. Wolf's 113th Group and others.

Above all, it is the story of the gun and automatic weapons battalions that served under these groups and the battalions operating with the divisions. The commanders of these battalions are listed in an attached tabulation. They were all excellent units. They were held in the highest regard by Corps and Division commanders and their staffs. They endeared themselves to the other troops in the corps and divisions. Some, probably due to more dynamic leadership, may have exceeded others, may have shot down more enemy planes. As most of the enemy air activity was in the forward areas, it is understandable that the battalions with the divisions and corps groups had more targets and consequently shot down more planes.

The efforts of the officers and men of these battalions contributed greatly to the successful operations of the Ninth Army. The spirit of these young officers and soldiers was magnificent and it seemed that the morale was highest in the units nearest the front. Visits to the battalions operating with divisions always resulted in a sort of inspiration—one came back with a feeling and an assurance that a fine job was being done. If space permitted, many anecdotes could

be related attesting to the superb leadership and personal courage of many of our antiaircraft commanders. Let it be said with quiet pride that all the antiaircraft units with the Ninth Army were "worthy of their hire."

Ninth Army AA Section—They Also Served

It is felt that a word of tribute should be paid to my assistants in the Ninth Army AA Section. Beginning with the initial organization and continuing throughout all operations this section functioned as an integral part of the Army headquarters. During all the various stages of organization and training of the Army headquarters, the Army commander and all the various sections of the headquarters had available to them advice on antiaircraft matters. During this period, every member of the AA Section made liaison with and gained the confidence of corresponding members of other sections. As a result it was felt that the fullest and best use of antiaircraft units was made when they became available for combat operations.

These men functioned quietly back at Army Headquarters—planning antiaircraft use in future operations, studying the needs of our AA units, analyzing results of antiaircraft activity, visiting AA units in position. They knew they existed for one purpose only—that of helping the AA units in the field to do the job assigned. And that knowledge motivated all their actions. Great credit is due the Executive, Col. Milan Weber, Operations Chief Lt. Col. Ken Tiffany; Maj. Bill Hollander who headed up intelligence matters such as radar, AAIS, aircraft recognition, etc.; Maj. Barney Droke in charge of supply matters; and CWO Jim Wilson who controlled administrative matters.

Tribute should also be paid to their able commissioned assistants Major Walt Burrell and Captains Jud Lowd, Bob McKeever, Gerry Carney, John Paddenburg and Frank Kuhfeld. The 26 enlisted men of the section were always a source of quiet comfort. Among them could be found almost every skill imaginable. And no job was too difficult or onerous for them. All 26 names could well be mentioned here. Failure to mention Master Sergeants Trumbla and Bejesky and Tech Sergeants Mitchell and Sanucci, men who were with the section from beginning to end, would leave a void in this account. The pleasant memories of the pleasures and hardships shared with all these men will ever remain.



In the creation of a sound military force for the armed defense of the Nation, there is no place for free competitive enterprise among the separate services. Security is a cooperative venture; it is not a competitive race. To forewarn aggressors and to construct effective military might, we are in need of partnership, not partisanship; concern for the safety of the Nation, not the survival of our arms.—*An address by General Omar N. Bradley, Chief of Staff, United States Army, at the Third National Industry Army Day Conference. Reprinted with permission of U. S. Naval Institute Proceedings.*

Artillery Career Field Ready With Upgrades In 14 Branches

Provisions for upgrading artillerymen through 14 job progression ladders have been announced in Special Regulations introducing the Artillery Career Field.

This makes the second of four combat career fields to be announced in detail, career jobs in the Infantry having been outlined earlier. Armored Cavalry and the Field Engineering Career Fields will be introduced subsequently in that order.

The 14 artillery branches in which the upgrading will take place include AAA weapons, AAA auto-

matic weapons, Field Artillery Weapons, Rocket Artillery, Animal Pack Weapons, Field Artillery Flash Ranging, Field Artillery Sound Ranging, Radar, Survey, Fire Detection, Liaison, Aircraft Warning, AAA Fire Control and Ballistic Meteorology.

New Grades

The following are typical examples of some T/O & E grade changes which will be made in basic Artillery Units:

	Old Grade	New Grade
<i>105mm Howitzer Battery</i>		
Chief of detail	2	1
Platoon Sgt.	2	1
Section Chief	3	2
Gunner	4	3
Asst. Gunner	5	4
Instrument Cpl.	5	4
Scout	5	4
Cannoneer	6	5
Computer	4	3
<i>105 Howitzer Bn. Hq.</i>		
Liaison Sgt.	3	2
Survey & Instrument Sgt.	3	2
Chief, Countermortar Sec.	2	1
Chief, Countermortar Observer	4	3
Countermortar Observer	6	5
<i>FA Obs. Battery</i>		
Sound Ranging Electrician	4	2
Radar Plotter	5	4
Surveyor Recorder	5	4
Flash Ranging Computer	6	5
Sound Ranging Computer	6	5
Flash Ranging Observer	6	5
Radar Operator	6	5
Rodman and Chainman	6	5
<i>AAA 90mm Gun Battery</i>		
Range Platoon Sergeant	2	1

	Old Grade	New Grade
<i>Gun Platoon Sergeant</i>		
Gun Platoon Sergeant	2	1
Radar Section Leader	3	2
Chief Director Operator	3	2
Gun Section Leader	3	2
Gunner	5	3
Squad Leader	4	3
Fire Director Observer	5	4
Azimuth Setter	5	4
Cannoneer	6	5
Assistant Gunner	6	5
Director Operators	5	5 & 4
<i>AAA AW Bn. Hq.</i>		
Chief Radar Operator	3	2
Plotter, Chief	4	3
Observer, Intelligence	5	5 & 4
Operator, Radar	5	4
Plotter	5	4
<i>155mm Howitzer Battery</i>		
Chief of Detail	2	1
Platoon	2	1
Chief of Section	3	2
Gunner	4	3
Gunner, assistant	5	4
Ammunition	5	4
Instrument	5	4
Scout	5	4
Cannoneer	6	5
Instrument (computer)	4	3

INSPECTOR OF ANTI-AIRCRAFT

By Colonel Homer Case, Coast Artillery Corps

It would be an exaggeration to say that the combat arms are the orphans of the Pentagon but it is true that the Infantry, Field Artillery, Coast Artillery (in these days really Anti-aircraft) and Armored Cavalry, with almost exactly one-half* of the Regular officers in the Army, have no one with the specific duty of looking after their respective interests. Yet there are six services in the Army, each headed by a major general, with a total of less than 1900 Regular officers. The four combat arms have over 11,000.

It is no exaggeration to say that there are thousands of line officers who look back with nostalgia to the day when they had a Chief looking after them in Washington. He might have been a choleric old character who gave most of the plums to the boys who served under him in the good old 99th but he and his staff provided a place to visit in the Munitions building. The General Staff has many virtues but few officers in the field think of it as a place of refuge in time of trouble.

This is not to infer that the General Staff does not give primary consideration to the problems of the combat arms. Nearly all the directors and most of the staff officers are combat officers. But often everybody's business is nobody's business. It would be talking out of school to mention one or two such cases with far reaching effects. Each of the divisions has its own sphere of responsibility and there are many problems affecting the Anti-aircraft that cut across all of them. In such cases an expert in the field can be a real help.

The chiefs of the combat arms were eliminated in the wartime reorganization of the Army in March 1942 for reasons that were at that time probably well justified. The system had its very obvious faults. But it also had its very obvious virtues. Might it not be possible in the final postwar reorganization of the Department of the Army to make use of the good points without taking too much of the bad? To have something less than the old chiefs of branches and something more than the nothing we now have?

This article deals specifically with the Anti-aircraft and its need for an officer in high places to present its point of view and to assist with problems pertaining to it. The discussion applies equally to the other combat arms and to a combined Artillery if such should be formed by joining the Field and Coast Artilleries. There are advantages and disadvantages to such a union and in due course the decision will be announced by the Chief of Staff.

Chiefs of Combat Arms

The combat arms had no chiefs of branches prior to 1907. In that year the Artillery Corps was split into the Field Artillery and the Coast Artillery Corps because of the increasing divergence of their matériel and tactics. Partly because the Coast Artillery had certain procurement functions, the

Office of the Chief of Coast Artillery was authorized. Our pre-World War I chiefs did much to foster seacoast artillery and to train and develop their officers and organizations. By 1917 the Corps was lusty and strong and with equal facility took on its various war tasks of manning 155mm guns, railway artillery and anti-aircraft.

The advantages of such an office were so widely recognized that on the demands of the other arms the National Defense Act of 1920 provided for Chiefs of Infantry, Field Artillery and Cavalry.

These four major generals held what was high rank between the two wars. The Deputy Chief of Staff was a major general and there were rarely more than two Assistant Chiefs of Staff that held that rank. The others were brigadier generals or colonels.

During most of this period the size of the War Department General Staff was restricted by law to 88 officers. The offices of the chiefs of the combat arms, while small by current standards, were fairly large in comparison. About 1938 there were approximately ten officers on duty in the Office of the Chief of Coast Artillery. They were all specially selected and accepted as experts in their various fields. All of these things gave the chiefs considerable power in the War Department.

The Chief of Coast Artillery in certain respects ran a semiautonomous empire. He was directly in control of the Coast Artillery School, the Coast Artillery Board, the Submarine Mine Depot and the COAST ARTILLERY JOURNAL. He had staff control of the Coast Artillery districts then located at the headquarters of each of the coastal corps areas and in each of the three overseas departments. He prescribed tactical doctrine for seacoast and anti-aircraft artillery, set forth procedures for target practices and published the results thereof. In many other matters, such as tables of organization and equipment, harbor defense projects, war plans involving anti-aircraft artillery, etc., he was the chief technical adviser to the General Staff and his recommendations were usually adopted without major changes.

In most of these activities there was little General Staff supervision. There was no staff section coordinating research and development. Projects of the Coast Artillery Board were generally processed directly with the Ordnance and the Signal Corps in the development and test of new weapons and equipment.

In 1917 anti-aircraft was assigned to the Coast Artillery and to an increasing degree development and use of new weapons in this field dominated the Office of the Chief of Coast Artillery. About 1926 anti-aircraft regiments at Aberdeen Proving Ground started the service tests of the fine new equipment designed by the Ordnance. These continued for several years and by 1931 our Army led the world in anti-aircraft weapons, especially heavy guns and directors. The credit for these great advances was probably due equally to the Chiefs of Ordnance and Coast Artillery.

*All statistical data in this article have been taken from the 1948 Army and Air Force Register. Figures include Regular Army officers only. In the absence of data on the total number of officers now on duty, these figures should be adequate for comparison purposes.

It was in the field of personnel that the chiefs were closest to the officers of their corps. During the 1930's there was but one officer in the Officers' Division, G-1, WDGS. He was principally concerned with broad policies. Most officer assignments were made by the branch chief. G-1 was concerned only with assignments to major posts and to general service schools. For all practical purposes the Chief managed the careers of his officers. For his 1100 Regular Coast Artillery officers he had but one personnel officer. The Chief, his executive and his personnel officer between them knew almost every officer. These three officers gave personnel matters their constant attention. This gave a continuity to personnel policies and a weight of considered judgment that did much for morale.

In 1942 the functions of the chiefs of arms were transferred to the Commanding General, Army Ground Forces, except that those pertaining to seacoast matériel were transferred to the Commanding General, Services of Supply.

The Coast Artillery was fortunate in that Major General Joseph A. Green, the last Chief of Coast Artillery, was given the Antiaircraft Command and took most of his office with him to Richmond. Until the end of the war the antiaircraft artillery still had a "Chief."

Where Are These Functions?

The functions of the former Chief of Coast Artillery are now widely scattered but most of them are being carried on somewhere. Where are the pieces of his defunct office?

The senior Antiaircraft officer is Major General John L. Homer, who commands the Antiaircraft and Guided Missiles Center at Fort Bliss, is Commandant of the Coast Artillery School and President of AFF No. 4 (Antiaircraft Board). It is here that antiaircraft doctrines originate, and tests and development of equipment take place. But General Homer has heavy duties in Texas that prevent him from being often available as an adviser to the Department of the Army.

As a practical matter Colonel Hobart Hewett, C.A.C., Deputy Director, Development Section, Army Field Forces, Fort Monroe, acts as the Chief of Coast Artillery in the field of development of antiaircraft matériel, a weighty responsibility for which he is unusually well qualified.

The personnel officers of the combat arms are now an integral part of the Personnel and Administration Division, Department of the Army. Colonel Joe D. Moss, C.A.C., heads the Coast Artillery Branch of the Career Management Group. No one has cause to complain of his skillful and understanding conduct of this office. But in controversial personnel matters there have been instances when four line colonels represented 11,000 combat officers and ten major generals presented the case of an equal number of service officers. Except for the fact that the Chief of the Career Management Group is himself a major general of the line the predominance of numbers and rank would be overpowering.

When they need advice or help there are many today who turn to Colonel W. I. Brady, C.A.C., the editor of this publication, for succor as they turned to the Chief's office in other days.

The officer who comes nearest to being Chief of Antiair-

craft today is now not even working within the Army. Nor has he served with this branch since he commanded an antiaircraft brigade in 1942. His high rank was gained as Commanding General, Army Service Forces. Lieutenant General LeRoy Lutes, Director of Staff, Munitions Board, National Military Establishment, is President of the Coast Artillery Association and often consulted on matters of high policy relating to antiaircraft and seacoast artillery. This, in spite of the fact that his work and primary interests have for years been in the field of logistics.

In a way, the operation of the combat branches is analogous to the batteries within a battalion operating without battery commanders—where one officer in battalion headquarters is responsible for the operation of all of the messes, another officer for the supplies, and another for the training of the various batteries.

There is one function that is not being performed today. There is no senior officer in the Army to go into the field and make technical and training inspections of antiaircraft troops. As the branch grows there will be an increasing need for someone to do this.

An Inspector of Antiaircraft

The basic proposal is that there should be a small staff group headed by a general officer in the Department of the Army representing each of the combat arms. The permutations of organization are too great for any firm recommendation. The following is a suggestion to test its practicability:

The title of the head is not important but he should not be called "Chief." "Inspector of Antiaircraft" is brief and is suitable since it is descriptive of one of his principal duties. It is a title used in some foreign armies for officers with similar functions.

The Inspector of Antiaircraft, as well as those of other arms, would be within the Organization and Training Division but much of his work would be with other General Staff divisions. He would have the rank of major general. The only additional staff member would be an executive, who might well be an expert in antiaircraft matériel. The other members of his staff would be moved from existing staff agencies. In addition to the functions listed below, the Inspector would serve as an expert adviser to the Department of the Army on all antiaircraft and seacoast artillery matters and represent the Chief of Staff in making technical and training inspections of antiaircraft troops.

He would take over the Coast Artillery Branch of the Career Management Group. This branch would then bear the same relationship to the Personnel and Administration Division as those of the services now enjoy. Career management would be one of his most important duties, and this part of his work, in the eyes of the officers in the field, would be the most important.

He would take over the Antiaircraft Branch of the Development Section, Army Field Forces, and with it the staff control of the Antiaircraft Board. This branch might well be semi-integrated with the Research and Development Group, Logistics Division. This procedure well might result in a small saving of personnel. And it would place all staff control of research and development under one roof.

The Inspector, under policies set forth by the Organization and Training Division and the Commanding General,

Army Field Forces, would be responsible for the Antiaircraft School.

He would exercise the Army control of the ANTI-AIRCRAFT JOURNAL.

There are in the other General Staff divisions and in the Army Field Forces several officers who spend all or part of their time in antiaircraft planning and in inspection and training of antiaircraft troops. Two or three of these should be made available to the Inspector for similar work. With the current increases in antiaircraft troop strength, this duty will assume great importance.

The day will come when there must be a transition from powder propelled projectiles to guided missiles for both antiaircraft and for the defense of our seacoasts. This transition will be difficult and will cut across the functions of every division of the General Staff. Technical advice in this field would be an important part of the duty of the Office of the Inspector.

What Are The Objections?

Yes, this sounds very much like the Office of the Chief of Coast Artillery under a new name. And it is—very much so. For it is an attempt to salvage the office without its disadvantages.

There is one big difference. In comparison to the old Chiefs, the Inspectors will not have too much power in the Department of the Army. We have accepted the principle of the dominance of the General Staff which is strong—and big. The Inspectors would be subordinate in rank and in echelon to the directors of the General Staff sections. This could not have been done in 1942 without a mighty battle but it can be done today and be welcomed by many.

A more common objection is that chiefs of branches foster branch consciousness. Is it certain that this is bad? It is today popular to say that we should all be "One Army." Might this not be a shibboleth? There might have been too

much branch consciousness in other days when the Cavalry was on the frontier, the Infantry at their battalion posts and the Coast Artillery on their islands. But today there is a healthy mingling of officers of all branches in schools and staffs and offices. In a sense each branch is a specialized profession. Is there harm in one being proud of being an artilleryman or an infantryman any more than in being a doctor or banker? During the midyears of the war the Army put on a terrific drive to exalt the Infantryman. He was extolled to the skies and given badges and extra pay. None of the other branches begrudged the Doughboys any of it but it did foster branch consciousness.

The morale and *esprit de corps* of the Navy and the Air Force are frequently pointed to as an example of the virtue of having no combat branches.

Is this correct? Do they have higher morale and can it be attributed to the fact that no branches exist within these services? Actually the over-all complexities affecting morale are so varied that no reasonably sound case can be made for this school of thought.

In the British Army the soldier is taught to have a fierce pride in his regiment. He thinks little of his branch or the service as a whole. There is sound psychology in this. Human beings like to "belong" to something that isn't too large. A soldier is proud of his regiment and his division. In days of peace when there are few regiments and divisions a branch is something to belong to.

A final objection is that there are too many staff officers already in Washington and that there are too many specialized staffs that cut across the functional organization of the Department of the Army. There is no ready answer to this one except to say that the increase in personnel might be kept to zero—for there is this work to be done—and that many feel that there was something of real worth in the old offices of the chiefs of branches that is missing today.



For a considerable period of time we have concentrated almost exclusively on the soldier. Perhaps it is time we gave a little sober thought to the men who may some day have to lead him in battle and upon whose ability and wisdom and judgment his life will depend. Therefore, while we strive to build a more perfect Army about the central core of our way of life, let us remember that such armies are not built by second-rate leaders with second-rate minds. Nor have our wars been won by such men. It is the devout hope of all of us that we may never again be engulfed in war; but if we should be, let us hope that the policies we adopt today will attract to our ranks the Eisenhowers and Bradleys of tomorrow.—*Brig. Gen. C. T. Lanham.*

YOKOHAMA AW SCHOOL

Patterned On AAA School, Fort Bliss

"Mahomet could not go to the mountain so the mountain came to Mahomet." The modern version of this is the 138th Antiaircraft Artillery Group Automatic Weapons School which could not send men back to the Artillery School in the States so it brought instructional methods of Stateside schools to AAA men of the Eighth Army in Japan.

The school, located south of the center of Tokyo in the former Hoshi Pharmaceutical College, utilizes instructional methods and training aids similar to those used at the Fort Bliss and Fort Sill Artillery Schools.

Col. George E. Young, commanding officer of the 138th AAA Group, in commenting on the progress made at the school said that efficient training methods will result in an unusually high state of training and that the success of this school will be apparent by the well trained antiaircraft artillerymen of the Group. He has high praise for the officers of the Department of the Army automatic weapons technical instruction team who were responsible for this project.

The 138th AAA Group Automatic Weapons School, with a total enrollment of 277 enlisted students, is at present holding two courses of study—the General Course and the Specialist Course. The students are subjected to intensive training in primary subjects during the general phase, and upon completion are selected for the specialist phase of training by dividing them into groups according to their particular MOS. During this period they are given training which will qualify them for their jobs in antiaircraft artillery.

The general phase, a beginners' course, is of 8 weeks duration and serves a twofold purpose. First, it is a refresher course for men with previous artillery training and, second, presents an over-all picture of antiaircraft operations to recruits and men who transfer to antiaircraft artillery from other branches of the service. In addition, this period serves as a student tryout during which the school authorities observe the work of each individual student with the object of placing him in the position for which he shows the most aptitude and is best qualified.

Subjects taught to students during the general phase are Basic Mathematics, Basic Electricity, Caliber .50 Machine Gun, 40mm Gun and Carriage, Artillery Drill, Gunnery, Machine Gun Turret, Directors, Power Plant Operation, Ammunition, Gun Sights, Tactics, Maintenance of Equipment, Remote Control Systems and Methods of Instruction.

In the specialist phase, a period of four weeks, each student is given intensive training in one of the following sub-



jects: Communications, 40mm Gun, Power Plant, Director, and Gun Turret. At the completion of this phase the students have mastered a four months' course of automatic weapons training in 12 weeks. The final test of the class instruction, practical work and on-the-job training is given the students in a two-week field problem. This is to determine how well the men are trained in their particular job.

This field problem involves the firing of all weapons taught at the school and the operation of all communication systems used in an automatic weapons organization. The teamwork of the many specialized sections is brought out by setting up problems that deal with possible happenings in the AAA battalion. The work of the communications section is coordinated with the fire director sections and gun sections as they fire weapons at many types of AAA targets. It is here that the students, regardless of their specialty, learn why it was important for them to study some trigonometry, electricity and the other subjects that are necessary for antiaircraft artillery training.

In addition to the training of newly assigned enlisted men the school will initiate a special course of instruction for the large number of officer replacement personnel who have been out of contact with antiaircraft artillery and are not familiar with the new and up-to-date AA equipment.

Instructors are all officers who have received training in the Artillery School at Fort Sill, Oklahoma and the Antiaircraft and Guided Missiles Branch of the Artillery School at Fort Bliss, Texas.

The present staff of instructors completed six months' intensive training for this work in April 1948 and came to this theater as a Department of the Army Team early in June. The senior instructor is Maj. William E. Holmes. Other instructors are, Maj. John K. Lee, Jr., Capt. Robert B. Jaffa, Capt. Raymond F. Aquilina, Capt. Harold R. Kressin, and Lt. Robert V. Krueger.



Operational Aspects of Guided Missiles

By Lieutenant Colonel Howard B. Hudiburg, General Staff Corps and Lieutenant Colonel Richard G. Thomas, Coast Artillery Corps

Part III

In preceding installments presented in the *Antiaircraft Journal*, the authors discussed the general background of the guided missile art, assumed the availability of certain hypothetical missiles and presented thoughts on some of the aspects of tactical employment, as well as strategic and tactical considerations.

The authors again wish to emphasize the fact that the primary purpose of this entire presentation is to stimulate thinking among its readers and to thus contribute, in some measure, to the efficient use of these new weapons as they become available. The authors, further, wish to again emphasize that, throughout this series, the plans, statements and opinions expressed must be accepted as entirely those of the authors and in no manner or intent reflect official planning, thought, weapons or techniques of the National Military Establishment or its component Departments of Army, Air Force or Navy.

Organization and Training Aspects

From the Army standpoint, guided missiles are artillery. Surface-to-air missiles will extend the range and effectiveness of antiaircraft artillery and surface-to-surface missiles will increase the range and effectiveness of field artillery as well as partially fulfilling the Army's requirement for tactical air support. Hence, we may expect that artillery of the future may have the following subdivisions:

1. Field artillery
2. Antiaircraft artillery
3. Seacoast artillery
4. Surface-to-air missiles
5. Surface-to-surface missiles

SAM will be employed in a manner similar to present AA. In fact, SAM and existing weapons must supplement each other just as automatic weapons and guns now do. The technique of employment will be an extension of present AA doctrine.

It would appear logical to assume that the battalion will be the basic tactical and administrative guided missile unit. Groups and brigades will constitute the command echelons and such commands may be expected to include both AA and guided missile battalions. At division, corps, and Army levels, guided missile units may be expected to form an integral part of the artillery and operate as any other unit possessing surface-to-air or surface-to-surface weapons of any type.

At division level, it would seem logical that guided missile battalions would function directly under the division artillery commander and be operationally controlled by fire direction centers, as now employed for other artillery. However, longer range employment would, no doubt, be controlled at corps level while the 150-500 mile SSM would be considered an Army or Theatre weapon.

We, therefore, expect no radical departure from presently conceived field organization; on the contrary, we should expect an orderly integration of new weapons into the existing artillery team, with operational control procedures based upon present antiaircraft and field artillery techniques.

At the present time, we have no highly developed guided missile tactics and techniques, and properly so, as we are now not in possession of our final-type new weapons. While it is true that we could, today, produce weapons which would have a profound influence on tactical operations, our present planning must be based upon assumed capabilities and military characteristics. Various agencies within the Army, among these being the Guided Missile Department of the Artillery School and the Guided Missile Service Test Section of Army Field Forces Board No. 4, functioning in the Antiaircraft and Guided Missile Center at Ft. Bliss, Texas, are, today, studying the impact of guided missiles upon present concepts and are planning for an orderly integration of these new weapons into our present weapons systems. This planning is, and must be, flexible and capable of including new capabilities resulting from technological progress.

In concluding this brief discussion of organizational aspects, it may be pointed out that the Germans were not successful in developing what they considered a truly satisfactory organization for guided missiles. Constant thought and planning, based upon field operations, is the only satisfactory attack on this problem. Of particular importance, is the determination of the proper ratio of technical to launching personnel and the proper ratio of tactical to service personnel. The constant study of future unit organization problems is one of the functions of the 1st Guided Missile Regiment at Ft. Bliss, Texas.

Training Factors

First of all, let us state here that this picture is bright. The present guided missile training program of the Army Field Forces is progressing rapidly and it is apparent that progressive planning will insure the availability of trained personnel in step with research and development progress. The present Army program consists of three parts:

1. Civilian schooling
2. Service Schools
3. On-the-job training

The civilian schooling program consists of a two-year guided missile course, leading to a Master's Degree. Graduates will be utilized in Army guided missile research and development, staff, guided missile unit, liaison and test range positions.

The service school program is conducted at Ft. Bliss, Texas, in the Guided Missile Department, Antiaircraft and Guided Missile Branch, The Artillery School. This program offers guided missile instruction to officers and enlisted men of all the Departments of the National Military Establishment and all components of the Army. The principal course is the Guided Missile Officers Course, of nine-month duration, embracing all phases of guided missile activity and preparing officers for service as instructors, range officers, test officers, guided missile staff officers, research and development planning officers and liaison officers. This program was discussed in detail in the November-December, 1948, issue of the JOURNAL by Lt. Colonel Lawrence W. Byers, Director of the Guided Missile Department of the school organization at Ft. Bliss.

On-the-job training consists principally of the assignment of officer and enlisted detachments from the 1st Guided Missile Regiment to developmental and test range facilities throughout the United States to participate actively in the guided missile activities in progress. Further, the Army Field Forces have assigned Liaison Officers to various developmental projects and these officers are receiving excellent, advanced, on-the-job training as well as performing well their primary mission of keeping Army agencies informed of developmental progress.

Training planning agencies must be ever cognizant of the need for proper utilization of the trained guided missile personnel. We should guard against the tendency for an individual to become "lost to the trade," as can happen when he is removed from the job for which he has been trained. Much time, money and effort have been expended on carefully selected individuals to produce these guided missile personnel. They should be utilized in guided missile assignments. The expanding developmental, test and tactical organizations will provide the spaces for keeping these individuals in this new field.

Costly Material

An important, in fact vital, consideration in guided missile training is the high unit cost per missile; particularly prior to the quantity production of "hardware." These "birds" are costly and a guided missile unit cannot expect to have hundreds or thousands of rounds available for training purposes, as in the case of conventional artillery. This consideration dictates the requirement for maximum utilization, for training purposes, of each "bird" fired. Because of the high unit cost, engineering and service test activities are combined to the maximum extent practicable. By the same token, these engineering-service-test activities should be utilized to the greatest extent possible for training purposes by means of active participation in firing activities by personnel being trained.

Research test missiles and captured German weapons

provide training vehicles for guided missile field training.

Simulators will be utilized to a great extent in training, providing a means by which realistic training can be arranged without the actual firing of a large number of "birds."

The peculiar fuels employed in many missiles, particularly rocket-powered missiles, make mandatory a highly efficient safety training program.

In concluding this discussion of training aspects, it may be well to stress that, even when standardized, "foolproof" guided missiles are developed for issue to tactical guided missile units, the requirement for a great number of highly trained specialists will exist. In fact, an indication of the recognized complexity of the field is indicated in a statement made by Dr. R. L. Hafstad, Executive Secretary of the Research and Development Board of the National Military Establishment and an outstanding figure in guided missile research and development. Dr. Hafstad said:

"In neither my civilian nor my military experience have I seen a problem which includes so many branches of physical science. Aerodynamics, radar, electronics, telemetering, servo-mechanisms, gyros, computers, thermodynamics, combustion, metallurgy, propulsion, and chemistry must all contribute to a successful guided missile."

Logistics and Supply

In our histories of past wars we find that the ratio of *service* personnel behind the lines to personnel in actual combat has been constantly increasing. In the last war it has been said that this ratio was approximately three to one. This does not include the vast numbers of nonservice personnel engaged in production and transportation. The reason for the continued increase in this ratio is generally considered to be the increased complexity of war itself and the corresponding increase in the supply problem.

The problem of wartime supply of guided missiles (excluding the possible use of an atomic warhead) promises to be a greater problem than the problem of aircraft supply in the last war. For detailed consideration of the problems involved, the problem of supplying guided missiles can be considered in three basic steps common to all war supplies: production, transportation to battle area, and assembly, testing, and delivery to using personnel.

Guided missile production in quantity can be expected to affect every major industry in the country. The component parts of a missile are so numerous and varied, yet so complex, that practically every type of skill in the country contributes to the completed missile. Many of the missile components are made of rare materials and production in quantity can be expected to tax the country's resources to the maximum. Also it must be borne in mind that guided missiles will not likely replace or decrease materially the need for war materials of the types used in the last war, therefore the production of guided missiles in quantity can be expected to be a major production problem in any future war.

Transportation

Once a missile has been produced, it must be safely transported to the area in which it is to be used. The sensitive elements of the missile will require large, well-insulated boxes carefully packed and transported. The warheads will

be large, dangerous, and require special handling. The fuels for the missiles will be highly inflammable and in many cases toxic. This will be a far greater transportation problem than any fuels commonly used today. All of these items must be transported safely and in great quantities if their use is to be effective.

In the Army, today, we have many specialized units whose primary job is to receive a certain type of war supply or weapon from the transportation agent, assemble and service it, and turn it over to the using unit. A specialized unit will be necessary to perform this function for guided missile units. Their function will probably include uncrating of components, assembly, preliminary testing, possibly fueling, and finally delivery to the using units. In order to support a large scale employment of guided missiles, units of this type alone would require thousands of highly trained men to complete their link in the supply chain.

A factor which we must consider in thinking of the impact of guided missiles on logistical operations is the effect on field supply problems. For example, the closing days of World War II, in the operation of Antwerp as a vital fort and center of distribution, clearly pointed out the effect of guided missiles on supply problems. The impact of guided missiles was felt at Antwerp, even though the weapons employed by the Germans were crude counterparts of the weapons of the future. An interesting consideration of the employment of guided missiles against Antwerp is the fact that the Germans gave us an impressive example of the capability of a combatant to employ guided missiles, thereby launching an air attack, without possessing air superiority. We must constantly bear in mind that, regardless of our own air superiority, the communications zone will henceforth be vulnerable to attack by new weapons.

Flexible Distribution

Let us consider what this will mean to field supply and distribution operations. Obviously, wide dispersal must be the keynote of all operations. We must have more and smaller depots, we must take greater advantage of any existing natural cover or concealment. We must, to the maximum extent possible, completely eliminate highly remunerative targets. This means reducing traffic in forts and utilizing dispersed, beach, supply-unloading techniques. Obviously, total tonnage requirements for a given zone of operations must be held to an absolute minimum. Rail operations must also be governed by flexibility and dispersal, with minimum concentration in marshalling yards. Personnel and bulk supply handling equipment requirements will, no doubt, increase. Further, to the extent possible, the communications zone must be self-sufficient. This is particularly true in the case of certain guided missile impedimenta for which it may be uneconomical to attempt supply from the ZI. For example, liquid oxygen, for rocket fuel, would, of necessity, be produced in the communications zone because of the impracticability of extended storage. Highway and air transport, highly dispersed by nature, must bear a large share of the supply distribution workload.

Obviously, greater dispersal, smaller depots, more forts and greater employment of highway and air transport make mandatory the virtual perfection of liaison and communications.

In summary of logistical considerations, we may list the following as possible impacts of widespread guided missile employment:

1. Production capacity will be taxed.
2. Strategic materials may be taxed.
3. Technical personnel requirements will be increased.
4. Communication zone operations must be characterized by dispersal.
5. Large material-handling equipment and techniques must be devised.

Let us suggest that you take our assumed weapons and place them in some assumed tactical situation. It may be readily foreseen that the introduction of these new weapons will present logistical problems of no small magnitude.

Concluding Remarks

In concluding this discussion, the authors would like to again stress that the entire presentation has reflected the personal opinions of the authors and in no way, is official doctrine, planning or policy implied or intended.

Many of the missile classifications and categories discussed herein have not been clearly defined within the National Military Establishment and may hence, not be agreed upon by all engaged in the guided missile field. However, it is believed that the general résumé presented, forms a satisfactory background upon which to base some constructive thinking. As previously stated, the primary purpose of this entire discussion has been to present, in a very general manner, some of the thought-provoking aspects of guided missiles, with a sincere hope, on the part of the authors of stimulating reader interest, particularly by those readers not now engaged in guided missile activities.

Admittedly, a great deal is now known about the impact of guided missiles on the future. We do know that, even today, we could produce weapons that would affect future military operations. Further, most guided missile thinking has focused attention upon the military aspects. What of the commercial aspects? Most assuredly, the advent of successful guided missiles will bring forth commercial applications to the American mind.

Obviously, a great deal is known about guided missiles which could not be included in our discussion. However, this in no manner should prevent you the reader, the potential military user of guided missiles, from giving constructive thought to the problems to be encountered in the field.

The advent of guided missiles will introduce new problems in future warfare, new problems in industrial and manpower mobilization. Because of the complex nature of guided missiles, manufacturing facilities and natural resources may be taxed. Will guided missiles "pay off"? While it is generally agreed that new weapons of some form are certain, it is just as certain that detailed operational analyses must be made to intelligently integrate these new weapons into the present concepts of warfare—which are becoming more complex daily.

From the Army standpoint, the tactical integration of these new weapons will probably be the lot of the artilleryman, in increasing his surface-to-air and surface-to-surface capabilities. While "push-button warfare" is not "just around the corner," some form of new weapons are certain.

HONOR ROLL

☆☆ 88th Antiaircraft Airborne Battalion ☆☆ 11th Antiaircraft AW Battalion (SP)



U.S. Army Photograph

In our last issue our readers were given the outline of a newly devised Honor Roll plan, the criteria for which are reprinted below.

On 16 April we were deluged with paratroopers! The newly activated 88th AAA Abn. Bn., commanded by Major Elmer W. Fox, reported 100% subscriptions among the officers assigned to this unit.

On 12 May, Lt. Col. Roy A. Tate forwarded new subscriptions from the officers of the 11th Antiaircraft Artillery AW Battalion (SP) which he commands, making this the second Fort Bliss unit to earn the two stars awarded to units whose officer personnel subscribe 100% to the JOURNAL.

1. To qualify for a listing on the JOURNAL Honor Roll, units must submit the names of subscribers and total number of officers assigned to the unit on date of application.
2. Battalions with 80% or more subscribers among the officers assigned to the unit are eligible for listing, provided that the unit consists of not less than 20 officers.
3. Brigades and groups with 90% or more subscribers among the officers assigned to the unit are eligible for listing, provided that the unit consists of not less than seven officers.
4. Units will remain on the Honor Roll for one year even though they fall below the 80% requirement during the year.
5. Lists of subscribers and statement of number of assigned officers must be submitted annually by units in order to remain on the Honor Roll.
6. Battalions with 90% of officers subscribing will qualify for one star placed after the unit's designation on the Honor Roll. Battalions with 100% subscribers will qualify for two stars.
7. Groups and brigades cannot qualify for one star but may qualify for two stars by having 100% subscribers.

(Units of all components will be listed together in the order of their percentages, beginning with the unit with the highest percentage.)

(Each unit listed on the Honor Roll will be given a one-year complimentary subscription to the JOURNAL.)

(Name of unit commander and date unit initially qualified for the Honor Roll will be listed with the designation of the unit.)

Survey of Japanese Antiaircraft Artillery

By GHQ USAFPAC AAA and Seacoast Artillery Research Board,
Brigadier General Rupert E. Starr, President

The Japanese failed to recognize the importance of anti-aircraft artillery until it was too late. Although lack of manpower was never a deterrent to expansion, the standard of training of officers and men to meet the increasing requirements for anti-aircraft artillery deteriorated to a low ebb during the latter years of the war. Newly organized units were considered "combat ready" when they received their men and equipment.

While failure to appreciate the requirements for anti-aircraft artillery resulted in the turning out of poorly trained or untrained anti-aircraft units, there was a more serious result of this failure in planning—a result which could not be met by any manner of improvisation. Guns and equipment could not be produced overnight. Although the production of anti-aircraft equipment was given first priority over all other ground arms in April, 1944, anti-aircraft guns and equipment could not be turned out in sufficient quantity on such short notice, even if our bombings had not disrupted their production schedules. The statement was iterated and reiterated by every officer interviewed on the subject—"Our AA defenses were inadequate." Many instances were noted where anti-aircraft guns had been set up to defend an important objective, but could not fire at night, because they had no searchlights or radar; nor could they fire at planes hidden by clouds in the daytime because they had no radar equipment. Many radars were out of action, or could be used only to limited capacity because of shortage of tubes—our bombings had put the factory producing these tubes out of action, and there was no reserve. Severe and crippling restrictions on anti-aircraft fire were normal because of the shortage of ammunition.

The general lack of quality in Japanese anti-aircraft equipment was even more serious than their shortages in equipment. The antiquated fire-control equipment for their anti-aircraft guns and the absence of a gun-laying radar worthy of the name were the outstanding deficiencies of the Japanese anti-aircraft artillery equipment.

It appears that the failure of the Japanese to anticipate their requirements for anti-aircraft artillery may be laid to two principal causes:

(1) There can be no question but that they had a false sense of security from air attack. In the words of Major General Irie, commanding the 2d AA Division and the defenses of Nagoya, "First, being an island country and isolated in the Pacific in the Far East, and secondly, on account of the want of knowledge of the rapid growth of aviation, the whole nation cherished an unreasonable sense of security. Until we really felt your attacks, most of our nation did not dream that we could have been raided to such a large extent and consequently subjected to such horrible destruction."

"The unreasonable sense of security resulted in a failure to give thoroughgoing consideration to national defense. From any point of view, either government, army, or by the

people, the need for the preparation for air defense was entirely disregarded, and thus was found sadly wanting. Under such conditions we came to have frequent air attacks upon our lands and finally our principal cities were completely ruined. I think these are the most important ones of several causes for our defeat."

(2) There existed originally the idea that the air force would furnish the primary air defense of the homeland, and



Jap AA Keki 20mm gun.

that anti-aircraft artillery was not too important. In the words of an officer from Imperial Headquarters, "Anti-aircraft at the beginning of the war did not do too well on hitting American planes, so air defense passed almost completely to the Air Forces. Later, however, the Army found they should have made more anti-aircraft, because it was impossible to produce enough fighters. This was decided during the time of your large-scale bombing attacks. We did not then have the establishments or the time to make additional anti-aircraft. At the end of the war anti-aircraft production (Army) was only about 50 heavy guns per month."

Personnel, both commissioned and enlisted, of Japanese anti-aircraft units, were representative generally of the Army as a whole.

Although the Military Academy provided a proportionate share of its graduates for the anti-aircraft artillery, this was entirely inadequate to meet the requirements for officers in the rapid expansion of anti-aircraft artillery during the war. Requirements for additional junior officers were met largely by the Cadet Section of the Anti-aircraft Artillery School,

which operated in a role similar to our Officer Candidate Schools. To meet the requirements in the higher grades, the Field and the Coast Artillery were drained of suitable officer material.

Manpower shortages never became a problem in the anti-aircraft artillery. When orders were issued for the activation of new units, the Area Army in whose area the new units were to be organized provided the necessary number of fillers from individuals newly called to the colors. A large part of the personnel for the newly organized unit came from existing units, which usually were kept at approximately 20% overstrength.

Except for some screening at conscription centers in order to provide the Air Corps with qualified technical men and the Infantry with physically well-qualified soldiers, there was no established system of classification of personnel prior to assignment to combat units, and there appeared to be no established procedure for reclassification of personnel.

Battle losses in anti-aircraft units were negligible and trained replacements were always available from the surplus assigned each unit.

There were ten general officers in the anti-aircraft artillery at the end of the war, of whom four were lieutenant generals, and the remainder major generals. All of these officers held anti-aircraft positions, either as commanders or as staff officers. The "Chief of Education and Training for Anti-aircraft Artillery" (sometimes called Chief of Anti-aircraft Artillery) was a Lieutenant General, as was the commandant of the Anti-aircraft Artillery School.

Civilians were not used in any tactical or technical capacity in anti-aircraft units.

ORGANIZATION

The organizational structure of the anti-aircraft artillery in the homeland was patterned to meet the static defense that was built up there. Although there was uniformity to the extent that the same types of organizational units were employed, namely divisions, regiments, battalions, and batteries, the strength and composition of these units varied greatly. Each anti-aircraft division had a geographical area, coterminous with that of an Area Army. The size of the division, determined by higher headquarters, was dependent upon the allocation of anti-aircraft artillery, which in turn was dependent upon the strategic importance of the area. The variations in size and composition of the smaller units resulted principally from expediency in adapting organization to the equipment available.

The largest anti-aircraft units, the divisions, functioned under the direct control of Area Armies (corresponding to our armies), which in turn were under the General Armies (army groups). The principal control of the General and Area Armies over anti-aircraft artillery was in the matter of strategic allocation and tactical disposition of units. No anti-aircraft section existed in Imperial Headquarters, nor on any high level of command was there any agency to coordinate the interests of the anti-aircraft artillery as to personnel, training, development, and equipment. The so-called "Chief of Anti-aircraft Artillery" was charged only with the supervision of anti-aircraft training.

Anti-aircraft artillery was represented in the headquarters of the General and Area Armies of the homeland by small



Jap AA 25mm twin guns mounted on Monument Hill overlooking Kisak Harbor.

special staff sections of from one to three officers. Officers were selected for these sections more on the basis of having attended the staff school (War College) than on their special knowledge of anti-aircraft artillery. These sections performed the normal staff functions as we know them.

Anti-aircraft artillery had no direct representation in the headquarters of any unit subordinate to the Area Armies, nor on the staff of the overseas Armies, even though anti-aircraft units might be assigned or attached to those forces.

Prior to 1939 the Anti-aircraft Artillery had been contained within the Field Artillery. At that time a separation took place, and Anti-aircraft Artillery achieved its own identity within the Artillery Corps, which then had three elements: field, anti-aircraft and seacoast. These were all under one Chief of Artillery until March 1945. At that time a separate office for the Chief of Anti-aircraft Artillery was established.

The Chief of Anti-aircraft Artillery was charged only with the supervision of anti-aircraft training, including the preparation of training literature and doctrine and supervision of the Anti-aircraft Artillery School. He had no over-all responsibility for anti-aircraft personnel, nor for the organization of anti-aircraft units and their unit training, since units were organized and received their training under the Armies. The submission of recommendations for the development of anti-aircraft matériel and equipment was not included within his responsibilities.

The major portion of the anti-aircraft artillery in Japan was organized into four anti-aircraft divisions which functioned under Area Armies as follows:

- 1st AA Division (Hqs at Tokyo) 12th Area Army
- 2d AA Division (Hqs at Nagoya) . . . 13th Area Army
- 3d AA Division (Hqs at Osaka) 15th Area Army
- 4th AA Division (Hqs at Fukuoka) . . 16th Area Army

Units of the divisions, located in isolated localities, were sometimes detached from the divisions and attached to numbered Armies or army divisions, for tactical control.

In addition, a small number of independent anti-aircraft units were in northern Honshu and on Hokkaido.

Each antiaircraft division was commanded by either a major general or a lieutenant general, and was composed of a varying number of regiments, battalions, and batteries. The personnel strength varied from 50,000 (1st AA Division), to 16,000 (2d AA Division).

Orders for the organization of antiaircraft units originated at Imperial Headquarters and were passed through the Army chain of command to the appropriate antiaircraft division commander. Orders might designate certain key officers or NCO's to be furnished by the Antiaircraft Artillery School or other outside sources. The remaining personnel would be furnished as follows:

(1) Trained personnel, both officer and enlisted, to make up a large proportion of the new unit came from other units under division control. Orders for transfer of these individuals would be published by the Area Army on recommendation of the antiaircraft division commander.

(2) Fillers, newly called to the colors, were furnished by the Area Army.

All regiments were composed solely of gun and searchlight units; automatic weapons units were organized into independent battalions and batteries. Regiments had two gun battalions and either one or two searchlight battalions. Normal gun battalions had six batteries, and searchlight battalions three batteries. Automatic weapons battalions usually had three or four batteries. Gun batteries normally manned six guns; searchlight batteries six searchlights, and automatic weapons batteries six automatic weapons. Many variations from the normal organization of regiments, battalions, and batteries existed.

TRAINING

Training in the antiaircraft artillery followed no uniform, organized pattern and met no fixed standards. The urgent need for antiaircraft artillery in the latter years of the war resulted in gathering together individuals with various degrees of training, forming new units, and setting up these units immediately in combat positions.

Besides the urgent need for antiaircraft artillery, other factors contributed to the poor quality of antiaircraft training:

(1) *Divided Responsibility.* The Chief of Training and Education for Antiaircraft Artillery, under the Inspectorate General, controlled the Antiaircraft Artillery School, the principal agency for the development of antiaircraft training doctrine. However, antiaircraft units were under the Armies. Although the duties of the Chief of Education and Training for Antiaircraft Artillery included inspection of training in these armies, his responsibility necessarily overlapped that of the Army commanders, who held command responsibility for training.

(2) *Lack of Supervision.* (a) Although they had complete command functions, neither the General nor the Area Armies, under which the antiaircraft units were organized and trained and under which they operated, exercised any supervision over the training of antiaircraft troops. (b) Training directives did not emanate from any headquarters higher than the antiaircraft divisions. (c) Inspections, except in the Tokyo area, were made by no tactical headquarters higher than the antiaircraft divisions. Inspections by



A 15cm AA gun. Tokyo, Japan.

representatives of the Inspectorate General of Training were infrequent. (d) No proficiency tests were prescribed by any headquarters or agency.

(3) *Lack of Training Facilities.* Organized training centers did not exist.

(4) *Shortage of Equipment and Ammunition.* This seriously affected all types of training.

The antiaircraft division commanders were responsible for training within their divisions. Upon the organization of a new unit (regiment, battalion, or battery), this responsibility was decentralized to the unit commander. Supervision of training by the division commander was customary. However, the manner of supervision, and the extent to which it was exercised, depended more upon the division commander than it did upon meeting any requirements of higher headquarters.

Basic training of the soldier, since much of it was received in civilian schools prior to induction, was fairly uniform. Unit training of newly organized units was the weakest feature of the training system. With no uniformity in time of training, with no uniform training programs or training objectives, with responsibility decentralized to the new unit commanders, without advantage of training center facilities or qualified training personnel, and handicapped by a lack of equipment, unit training in preparation for combat scarcely existed. Units were considered "combat ready" when they received their men and equipment. Difficulties in maintaining a satisfactory training status of old units resulted from the drain on personnel of these units to form new units, as well as from the inability of units to fire their weapons in target practice.

Limited use was made of instruction teams, sent from the Antiaircraft Artillery School, in conducting training on special subjects within the antiaircraft divisions. Except for radar operators, the training of individual specialists was given little attention.

The Antiaircraft Artillery School served functions generally similar to those of our Antiaircraft Artillery School, but with variations therefrom as follows:

(1) All courses for officers were command courses (regimental, battalion and battery).

(2) There were no courses for enlisted men, as such,

although training was given enlisted men in the Training Regiment (school troops).

(3) Except for radar courses, there were no strictly specialist courses.

(4) Some antiaircraft firing was conducted by school personnel but this was not a prescribed part of the courses during the latter war years.

(5) A Cadet Section served the functions of an Officer Candidate School.

(6) A Military Students' Section trained young men (15-16) from the civilian schools, as prospective NCO's.

(7) The Research Section might have been expected to have functions similar to those of our Antiaircraft Artillery Board. Actually, it had no responsibilities in connection with the development of equipment. Its primary responsibilities were the preparation of training literature and doctrine, and the development of technique for the use of weapons.

A training battalion in each antiaircraft division served the purpose of a division school. Most of the students were NCO's or men who would become NCO's; however, small classes for officers or officer candidates were also held. Courses at the Antiaircraft Artillery School and in the special training battalions were limited largely to practical work, with a minimum of classroom instruction.

Limited use was made of training aids, most of which were of crude design, and locally improvised. Training films were not available to organizations and had but limited use at the Antiaircraft Artillery School. Training literature was limited to a series of manuals, closely approximating our field or technical manuals. Published by the Inspectorate of Training and covering primarily operational technique, these received general distribution to antiaircraft units and individuals in the homeland.

The firing of target practice during the war as a part of unit training was curtailed almost to the point of discontinuance. Inability to relieve units from defensive missions and a shortage of ammunition, gasoline, and tow-target equipment were the principal causes.

MATÉRIEL

Although Japan was at war, if the China incident is included, longer than any other major power participating in World War II, she ended the war with antiaircraft weapons which were greatly inferior to those of any of the other first-class powers. Compared with the other great powers, progress in the development of antiaircraft weapons, or in the technique of their use, during the last six years, was negligible.

Her principal mobile antiaircraft gun, the 75mm (1928), her 20mm automatic cannon, and most of her searchlights, at the end of the war, were weapons which had been designed and placed in production long before the start of the war. No intermediate caliber automatic weapons had been produced. Her best antiaircraft gun director, designed in 1937, was too complicated for wartime mass production, so the Japanese were forced to revert to an earlier but simpler type. The supplementary fire-control equipment used with these simple directors was likewise antiquated. Sound locators were standard equipment for antiaircraft searchlight units. The development of radar was initiated during the war, but Japanese antiaircraft radar at the end of the war

was where ours was at the beginning.

The primary reasons for failure to keep their own equipment abreast of antiaircraft developments in other Armies are believed to be:

(1) A lack of foresight in appreciating the possibility of serious air attack, and particularly the importance of antiaircraft artillery;

(2) The failure, in the organizational structure of the Japanese Army, to place any responsibility for the development of the weapons on the users of the weapons;

(3) The ineffectiveness of the over-all organization for development, with its lack of coordination between the Army and the Navy;

(4) The failure to utilize to the maximum extent the combined research facilities of the nation;

(5) A failure of the intelligence agencies to evaluate progress in development in foreign armies, and a failure on the part of Imperial Headquarters to utilize such lessons as were learned;

(6) Inability of Japanese industry to produce, in substantial quantity, any equipment of a complicated nature.

Although some of the newer Japanese antiaircraft guns appear to have been effective artillery pieces, their over-all efficiency was severely limited by the obsolete and utterly inadequate fire-control equipment. This was the greatest single contributing factor to the ineffectiveness of the Japanese antiaircraft artillery.

Japan entered the war with two types of antiaircraft guns: the old 105mm Type 14, designed in 1925, and the 75mm (mobile), designed in 1928. It should be noted that the 88mm, although designed in 1939, did not go into production until 1942.

Three new guns were produced during the war: a 120mm gun in 1942, a 75mm mobile gun in 1944, and a 150mm gun in 1945. Approximately 150 of the 120mm guns were produced; 65 of the 75mm; and but 2 of the 150mm. The 120mm gun, while inferior to ours in that it was not mobile, had a lower rate of fire, and lower muzzle velocity, was, nevertheless, a fair antiaircraft gun. The 75mm mobile gun was greatly inferior to our 90mm mobile gun. The development of the 150mm gun was undertaken in order to provide a weapon which could fire at altitudes in excess of 35,000 feet, at which the Japanese expected our B-29's to operate. When our planes did not bomb from these altitudes, but from altitudes which could be reached by the 120mm gun, the Japanese discontinued the program for production of the larger guns.

Little attention was given to the development of intermediate caliber weapons of the automatic type. Efforts to develop a 37mm gun, copied after a captured German gun of the same caliber, failed because of the inability of Japanese industry to manufacture complicated equipment. A 40mm gun, copied after the Bofors, had been designed by the end of the war, but no guns were produced. Thus, the largest antiaircraft automatic weapon in use by the Army at the end of the war was the 25mm, which had been developed by the Navy.

The Japanese failed to appreciate the importance of radar, with the result that development was not started until 1943. Although five different models were in use by antiaircraft troops at the end of the war, all of which were based on old

US or British designs, the over-all supply was totally inadequate to meet the requirements (sets were available at the approximate rate of one per six batteries).

An additional model, based on the German Wurzburg, was to have been placed in production near the end of the war. This is the only instance that came to the attention of the Board wherein the Japanese had received any assistance from Germany in antiaircraft matters.

The inaccuracies of their existing radars for gun-laying purposes were so manifest to the Japanese that they were used for this purpose only as emergency equipment. Moreover, their sensitivity to our countermeasures, particularly jamming, made them practically useless under conditions where these measures were employed.

Directors for antiaircraft guns, as well as accessory items of fire-control equipment, were of types comparable to those which we used 10 to 15 years ago. Effort was made, in 1942, to place in mass production an improved director (linear-speed), designed in 1937. Here again, the inability of their manufacturing industry to produce this complicated equipment in volume, forced the Japanese to revert to the production of a modified type of an older director (1930). Since this director did not solve the fire-control problem completely, it was necessary that it be supplemented by two additional articles of obsolete equipment, the Target Speed and Course Angle Calculator (1930), and the Cotangent Plotting Board (1935). This multiplicity of fire-control equipment, none of which was automatic, resulted in maximum opportunity for personnel and transmission errors and large time lags, all of which comprised the factors most largely responsible for the very low effectiveness of Japanese antiaircraft artillery.

Although a course and speed sight had been developed, most automatic weapons used a speed ring sight. An "off-carriage" director, which gave promise of being effective, had been developed, but had not been battle-tested.

Japanese antiaircraft artillery ammunition was, almost without exception, conventional, both as to type and design. All ammunition was fixed, including the 150mm round, which was over 5 feet long and weighed 186 pounds.

A high explosive round existed for all calibers, including the 13.2mm (approximately .50 caliber). The 25mm and smaller calibers were equipped with tracer and, except for the 13.2mm, with self-destroying elements.

Some experimentation had been done with rockets for antiaircraft use, as well as with a fuze which could be activated by radar, but by the end of the war little had been accomplished.

TACTICAL EMPLOYMENT

The over-all strategic deployment of the antiaircraft artillery was controlled by Imperial Headquarters, by making allocations to the General or Area Armies, as well as to the overseas armies.

Within the homeland priority for the allocation was given to areas in the following order:

Tokyo (12th Area Army and 1st AA Division)
Kyushu (16th Area Army and 4th AA Division)
Nagoya (13th Area Army and 2d AA Division)
Osaka-Kobe (15th Area Army and 3d AA Division)

Kyushu was given its high priority in anticipation of our invasion of that island.

Within their respective areas, commanders of the Area Armies set up the priorities for antiaircraft defense, and determined the strength of the defenses for the various objectives.

In setting up priorities, the Area Army commanders were guided by general policies of Imperial Headquarters and the General Armies. In the Tokyo area, control was centralized to the extent that not only were priorities determined by higher headquarters, but actual gun sites were selected on this level of command.

The concentration of the major portion of the Japanese war industry in a few large urban areas resulted in the concentration of the bulk of the antiaircraft artillery around these cities.

Although the bulk of the antiaircraft artillery was concentrated around large industrial areas, there were many examples of scattered antiaircraft units which might have been used more profitably in strengthening the defenses of the more important objectives.

The Imperial Palace had the highest priority for antiaircraft defense of any objective. Throughout Japan airplane and munitions plants, and harbor facilities were on a high level of priority. Airfields, as such, were on a low priority. Anticipating an attack on their communication lines, the Japanese gave bridges an increasingly high priority near the end of the war. Naval installations usually were defended only by naval antiaircraft artillery.

The defenses were designed primarily against high-flying planes. Automatic weapons defense—defense against low-flying planes—received little consideration and was woefully inadequate. This resulted from two factors:

(1) The Japanese had few automatic weapons, and such as they had were of small caliber;

(2) The B-29's, until the last months of the war, appear to have been the only planes to which serious consideration was given.

Little or no consideration was given to the protection of ground troops and establishments, or to the use of antiaircraft weapons in ground roles.

The larger defenses were coordinated gun and searchlight defenses. At its maximum, Tokyo, the largest, had 551 heavy guns and 239 searchlights. Such automatic weapons as were available usually were disposed around pin-point targets within the larger areas.

Because of the immobility of equipment, the defenses were largely static in nature.

The smaller defenses ordinarily were not balanced defenses, and frequently were unable to perform their assigned mission.

All elements of the defenses were concentrated closely, with distances between fire units or searchlights considerably less than we normally use. In many instances multiple gun batteries were set up to permit concentration of fire. However, the fire of each battery was controlled by its own fire-control equipment.

In establishing the gun defense, consideration was given to the prevailing wind and the expected direction of attack. The winds were consistently from the west and average 150 to 200 miles per hour at 25,000 to 30,000 feet altitude. The

defenses were established on the assumption that we could not bomb effectively from other than within narrow sectors either upwind or downwind.

Although a BRL (bomb release line) was used in planning the defenses, the shortage of guns usually prohibited extending the defense far enough out to insure having guns on or just inside the BRL. The defense was tightened or closed on the objective to insure that all batteries were mutually supporting.

To compensate for the heavy wind factor, the BRL circle was offset into the wind from the center of the defended area.

In establishing the defense for a large area containing several small objectives, a defense was set up for each objective and then coordinated to limit the extent of overlap.

In a defense made up of several calibers of guns with varying ranges, effort was made to balance the defense by gun calibers.

Because approximately 90% of the guns were fixed or static, and required preconstructed stable platforms (usually of concrete), any readjustment of the defenses was predicated upon the time of construction of the new emplacements.

Searchlights had the primary mission of illuminating for gunfire. On occasion, they were used to illuminate for friendly fighters, but only in one area (Tokyo) were searchlights ever disposed primarily for this purpose.

The automatic weapons defense was set up without reference to the gun and searchlight defense and consisted, in general, of separate local defenses for point objectives within the area.

In at least one area (Shimonoseki), antiaircraft guns had been mounted on flak barges. These were not especially designed for the purpose, and were unsatisfactory; therefore, it had been planned to remove the guns to shore positions.

In the large urban areas, in order to get the outer searchlight ring in advance of the guns, searchlights were mounted on boats, or in exceptional cases, on pilings. Because of the fire hazard, antiaircraft weapons were not mounted on flak towers. No railway mounted heavy guns existed.

Barrage balloons had been used to a limited extent in some defenses, but because of their altitude limitations, had been considered unsatisfactory. Smoke screens were not considered effective in antiaircraft defense, and it was felt that any value gained was more than offset by the interference with antiaircraft fire.

OPERATIONAL CONTROL

Operational control over the antiaircraft artillery was vested in the antiaircraft division commander or, where the antiaircraft unit was not a part of a division, in the senior antiaircraft unit commander. Above the antiaircraft division, the next senior in the chain of command was the Area Army commander, who made no attempt to influence antiaircraft operations. Little, if any, consideration was given to the activity of friendly fighters.

The division commander exercised practically no direct control over subordinate elements during battle. He made no attempt to assign targets to units. Prior to action, he issued directives as to sectors of fire, priority of targets, altitudes and ranges for engagement, and conservation of am-

munition. He alerted subordinate units and collected, evaluated and disseminated information prior to and during battle. He did not restrict or limit antiaircraft fire to permit action of friendly aircraft.

Regimental commanders exercised no operational control over their units during battle. The regimental commander was tied into the communication net laterally, so that he was familiar with all information passed and orders given to his units. This was for the purpose of facilitating corrective action after the battle rather than of enabling him to influence the action during battle.

Battalion commanders were directly in the chain of command from division. Gun battalion commanders exercised control over fire by assigning targets, ordering the time of "Commence Firing," and changing target assignments. Searchlight battalion commanders exercised close supervision over the action of their lights, designating which battery and how many lights would illuminate, and occasionally directing the time of illumination. Automatic weapons battalion commanders did not exercise any operational control over their units during battle, although they did prescribe maximum ranges for engagement of targets.

Japanese antiaircraft commanders all admitted they had found no workable method for coordination above battery level of fire during saturation raids. Selection of targets for guns and searchlights was left entirely to the battery commanders.

Little operational control could be exercised over the antiaircraft artillery at night or under conditions of poor visibility. Since their radars were practically useless for gun-laying purposes, and they were dependent almost entirely upon searchlight illumination, they were limited to firing on targets of opportunity. There were many instances where the Japanese were unable to fire a single round of aimed fire against large raids at night where the raids were above overcast.

AIR DEFENSE

An over-all organization for active air defense, to include coordinated effort of fighter aviation, antiaircraft artillery, and aircraft warning service, did not exist in Japan. Responsibility over the land area, exclusive of naval bases, was divided between the Army Air Forces, operating the Army fighter aviation, and the ground forces, controlling the antiaircraft artillery. Between the two, there was no coordination. The Navy had its own fighter aviation and shore-based antiaircraft artillery. The aircraft warning service, elements of which were operated under the air forces, the Army intelligence units, the Navy, and the Department of the Interior (civilian visual observers), was, by contrast, a highly coordinated element of their air defense organization, which served effectively the Army, the Navy, the Air Forces, and the civilian population.

At the beginning of the war, some effort was made to coordinate the operations of the antiaircraft artillery and the fighters by means of restricted areas and altitude controls. This, however, appeared to be more a matter of cooperation by commanders in an area, than a coordinated effort from above.

At the end of the war, no coordination except for exchange of liaison personnel existed between the antiaircraft

artillery and the air forces. Antiaircraft artillery could fire at any time regardless of whether Japanese planes were operating in the area. The air forces could operate in any area, at any time, regardless of any antiaircraft gun defenses.

Indirect liaison was maintained between the antiaircraft artillery and the air forces at the various Area Army Information Centers, where a liaison officer from each service was always on duty.

Direct liaison was maintained at the antiaircraft division operations room, where the air force unit, located in the immediate area, kept a liaison officer on duty.

Except for the exchange of warning information there was no coordination and little cooperation between Army and Navy antiaircraft artillery. Naval antiaircraft artillery could be emplaced in an area where the antiaircraft defenses were predominantly Army, and the only coordination consisted of that required in siting the guns. The extreme example of the lack of cooperation was in the use of equipment for identifying planes (IFF), where the two services used different identification frequencies with the result that an Army plane could not be distinguished from an enemy plane by the Navy, and vice versa.

Against our B-29 raids, the Japanese early warning service was the most efficient and effective element of their air defense. Although communication troubles offered some difficulty because our bombing operations disrupted the telephone lines, in general, the information of these raids was timely and reliable. Almost without exception, witnesses stated that at least one hour's warning was received on all large raids of B-29's.

Early warning against low-flying planes was not as effective, inasmuch as these could not be identified by the radar pip, and was thus dependent upon visual identification.

The following sources of information were utilized:

Long Range Radar. This was the primary source of early warning, and was extensively utilized. Radar sets, either Army or Navy, with ranges of 120 to 180 miles, were installed along the entire coast of Japan, as well as on some of the outlying islands. At many sites multiple sets had been installed. This not only facilitated continuity of operation, and widened the sectors of search, but also enabled the following of the various subdivisions of a formation of planes that may have split to attack different objectives.

Doppler System of Detection. This was, in effect, a series of radio "fences," employing the Doppler principle of detection, whereby established lines, when cut, gave warning of the passage of planes through these lines.

Visual Observers. Both civilian and military observers were used extensively throughout the mainland of Japan. Approximately 1,600 were employed in the area of the 12th Area Army (central Honshu, including Tokyo) at the end of the war.

Picket Boats. These were used by the Navy, but by the end of the war, most of them had been sunk or driven from the sea.

Monitoring of Allied Radio Communications. This was based on a study of "traffic-volume," but was not highly effective, particularly near the end of the war.



Dummy AA gun constructed by Japs at a fish oil and acid producing factory at Wakayama, Honshu, Japan.

COMBAT OPERATIONS

The many weak features of the Japanese antiaircraft artillery have been brought out in the preceding paragraphs. Strong features, such as the early warning service, have not been overlooked.

The true effectiveness can best be measured by results in combat. Statistical data, taken from official records of the United States Strategic Air Forces, including operations to the end of the war, indicate clearly that Japanese antiaircraft artillery did not in any way attain the combat effectiveness of the American, British or German antiaircraft artillery. Our B-29 losses, exclusive of known operational losses, were:

	Planes Lost	Percent- ages*
a. Due to known antiaircraft action only	48	.176
b. Due to known enemy air action only	58	.213
c. Due to combined antiaircraft and air action	29	.106
d. Due to all known hostile action (Total of a, b and c)	135	.495
e. Due to unknown causes (including operational)	79	.290
f. Due to all enemy action and unknown causes (Total of d and e) ..	214	.785

*Based on 27,261 sorties over the Japanese homeland and exclusive of mining operations.

REPORT ON AAA EXPANSION

Following is a list of units that have been activated at Fort Bliss, or will be activated there in the near future. This list contains those units previously reported in the January-February issue of the JOURNAL:

Brigades:

31st AAA Brigade
34th AAA Brigade
35th AAA Brigade

Groups:

5th AAA Group
10th AAA Group
11th AAA Group
12th AAA Group
16th AAA Group*
17th AAA Group*
19th AAA Group
22d AAA Group (replaces 267th,
which has been inactivated)
68th AAA Group
80th AAA Group
91st AAA Group*

Battalions:

4th AAA AW Bn (Mbl)
5th AAA AW Bn (Mbl)
30th AAA AW Bn (Mbl)
32d AAA AW Bn (Mbl)*
39th AAA AW Bn (Mbl)
60th AAA AW Bn (Mbl)
450th AAA AW Bn (Mbl)
3d AAA AW Bn (SP)
8th AAA AW Bn (SP)
11th AAA AW Bn (SP)
15th AAA AW Bn (SP)
21st AAA AW Bn (SP)*
50th AAA AW Bn (SP)*
59th AAA AW Bn (SP)
62d AAA AW Bn (SP)
82d AAA AW Bn (SP)
443d AAA AW Bn (SP)*

41st AAA Gun Bn (90mm)*
67th AAA Gun Bn (90mm)
68th AAA Gun Bn (90mm)
69th AAA Gun Bn (90mm)*
70th AAA Gun Bn (90mm)
78th AAA Gun Bn (90mm)
95th AAA Gun Bn (90mm)
504th AAA Gun Bn (90mm)
75th AAA Gun Bn (120mm)
79th AAA Gun Bn (120mm)
96th AAA Gun Bn (120mm)*
501st AAA Gun Bn (120mm)
502d AAA Gun Bn (120mm)
518th AAA Gun Bn (120mm)
519th AAA Gun Bn (120mm)
88th Abn AA Bn

*To be activated in June 1949.

In addition to the above AAA units, the 1st Guided Missile Regiment and the 2d Rocket Field Artillery Battalion have been activated at Fort Bliss.

OFFICER PROCUREMENT

Company grade officers to arrive at Fort Bliss during June:

FA officers who have completed a competitive tour	14
CAC officers relieved from detail from other arms and services	48
Infantry with CAC background	168
Total	230

In addition to the officers enumerated above who are to be detailed in CAC during June, it is estimated that approximately 300 more will be required and will be obtained from other branches by detail to CAC during July and August.



America is preparing her house for peace—or war. Peace will be the invited guest, but war may crash the party. It has happened before. World Wars I and II involved us unwillingly in bloodshed that we hope will never be repeated. But in this world of conflicting aims and ideologies the United States must be ready for any emergency.—
Thomas J. Hargrove, President of The Eastman Kodak Company.

AIR DEFENSE OF THE UNITED STATES

By Lieutenant Colonel Floyd A. Lambert, USAF

The Radar Bill, H.R. 2546, became Public Law 30 on the 30th of March 1949 when it was signed by the President. This legislation was introduced in order to obtain Congressional approval of the USAF plan to erect a radar screen around the United States and Alaska. During World War II the Air Corps erected a radar screen around the United States without Congressional approval, but in peacetime it is not considered advisable to purchase and improve the large amount of real estate required for the large number of radar stations and Air Defense Control Centers included in the plan, without Congressional approval.

The cost of the radar screen is estimated to be 161 million dollars, 85 million of which must be appropriated by Congress. The difference represents the value of radar equipment and other items on hand within the Air Force for which additional funds are not required.

The manpower for the radar screen totals 22,647 officers and airmen of which 9399 are Regular Air Force personnel and 13,248 are Air National Guard. During peacetime the radar screen will be manned understrength by Regular Air Force personnel, but in case of war or national emergency the Air National Guard troops will be ordered into Federal service to bring the manning up to one hundred per cent.

The Air Force Air Defense plan stems from the Air Force global concept of air power. It is briefly, that in event of another war the decisive blows are expected to be delivered on a global scale by strategic air power. It is believed the enemy will deliver the first blow, "Pearl Harbor" style, and that the U. S. Strategic Air Force will retaliate by dropping atomic bombs on vital enemy targets. Powerful air blows will be exchanged with the enemy until a decision is reached in a manner similar to the surrender of Japan in World War II.

The radar screen, more accurately described as a radar station network in depth, is needed; first, to detect the ap-

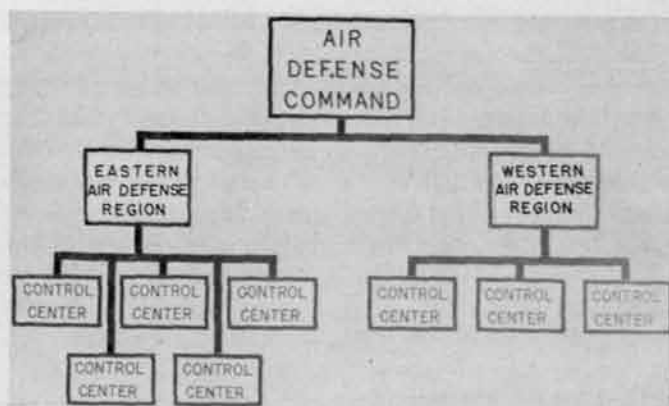


Figure 2

proach of enemy strategic air forces and alert all friendly defensive forces, both civilian and military; and second, to accurately track the position and altitude of the attacking air forces while directing interceptor aircraft and coordinating antiaircraft artillery fire. The interceptor aircraft may be regarded as highly mobile antiaircraft artillery, which will be used beyond the range of AA guns.

It is expected that certain vital target areas will be designated as "Gun Defended Areas" and that all aircraft, civilian or military, will be forbidden to enter the air space within gun range of these areas without prior permission.

For purposes of air defense the Air Force has divided the U. S. into Air Defense Areas as shown on the map, fig. 1. These areas have no relationship to the numbered Air Force or army areas. The only object of the USAF air defense areas is to decentralize the responsibility for controlling the air space above and adjacent to the United States. In peacetime the control of the air space will be decentralized to eight areas, as indicated on fig. 1, each controlled by a regular Air Force Air Defense Control Center. In time of war the Air National Guard will be called into Federal Service and the areas further divided making a total of twenty. The Air Force Air Defense Control Centers are represented in fig. 1 by stars and the Air National Guard Air Defense Control Centers by dots.

The Air Defense Command was reorganized on 1 December 1948 and given only one mission, the active air defense of the United States. Figure 2 gives the organization of the Air Defense Command. The air defense of the United States is to be decentralized into two subordinate headquarters, one to command the air defense of the eastern United States and the other the western portion. The dotted line in figure 1 is the line dividing the east from the west into two Regions.

The Control Centers shown in figure 2 are the eight USAF Air Defense Control Centers that will be used to control the air space above the United States in peacetime. The Air National Guard air defense control centers are not shown but in event of war they will be added to make a total of thirteen control centers in the Eastern Region and seven in the Western. Each control center is to be organized under

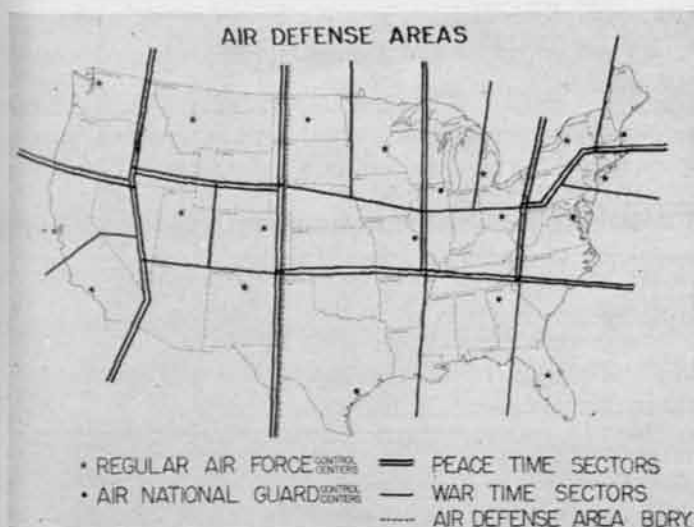


Figure 1

a unit termed an Air Defense Division. It is to be commanded by a Brigadier General and each will have several fighter wings and groups assigned to provide the Fighter Force and one aircraft control and warning group to operate the control center and radar stations.

It is believed that the air defense of the United States is vital to all three armed services. It is, therefore, planned to establish a joint command on both the east and west coasts of the United States. It is expected that the Army and Navy together with the Air Force will allocate to the Air Defense Commands operational control of those forces physically present in the United States which have an air defense potential. For example, an aircraft carrier docked in the New York harbor would be expected to make its fighter aircraft available for the defense of New York city. Likewise

all Army organizations with an air defense potential would be integrated into the over-all air defense system.

The term, operational control, is defined as those functions of command which pertain to the designation of aerial targets and the authoritative direction necessary to accomplish their destruction. It does not include such functions of command as administration, internal organization, logistic support and unit training except in such matters as the subordinate commander may request assistance.

In subsequent issues a number of air defense subjects briefly discussed in this article will be elaborated upon. It is planned to include the functions of the air defense control center in a forthcoming issue showing how the control center coordinates all friendly air defense forces located in its area to minimize the effects of enemy air attacks.



Excerpts from STANDING OPERATING PROCEDURE Hq. 74th AAA Brigade

Brigadier General Harry F. Meyers, Commanding
dated 1 February 1945

STATES OF READINESS:

One of these states of readiness will exist at all times. States of readiness may be amplified locally so long as they are not reduced in effectiveness.

Normal states of readiness will be State II by day and State I by night. All fire units will immediately assume Action Stations when warning of imminent enemy action has been received, an attack is in progress, or communications fail.

Forty millimeter guns, except those out of action for maintenance, will have seven rounds in the automatic loader and eight rounds in the "toast rack." If the situation dictates, a round may be kept on the loading tray. When there is no round on the loading tray, the rammer shoe will be forward and the breech block in the raised position.

M-51's will be half loaded, ammunition belt inserted and extractor grasping one round, with no ammunition in chamber.

<i>Equipment</i>	<i>State I</i>	<i>State II</i>	<i>Action Stations</i>
AAA GUNS Day & Night	CP and Fire Control sections manned in 3 minutes. Guns in 5 minutes.	CP and Fire Control sections manned in 1 minute. Guns in 3 minutes.	Fully manned, ready for instant action.
AUTOMATIC WEAPONS Day	75% of guns with minimum detachment* in five minutes. If necessary remainder of guns may be out of action.	Minimum detachment* on all guns; remainder of Section at 1 minute's notice.	Fully manned, ready for instant action.
AUTOMATIC WEAPONS Bright night	All guns with 1 man at post and 3 men sleeping at each 40mm gun site and one man sleeping at each M-51. Remainder of section at 3 minutes' notice.	All guns with 1 man at post and 3 men sleeping at each 40mm gun site; one man sleeping at each M-51. Remainder of section at 1 minute's notice.	Same as day.
AUTOMATIC WEAPONS Dark night	One man at post. Remainder at 3 minutes' notice.	Same as State I.	Same as day.

*Minimum detachment will consist of four men for the 40mm gun and two men for the M-51 Mount.

STATUS OF TRAINING LITERATURE

The following list of training publications now under preparation, being printed or recently published is compiled specifically for AAA personnel.

Those projects marked with a double asterisk (**) will be submitted to the Director of Organization and Training, GSUSA, for further coordination review and approval prior to printing. A single asterisk (*) indicates that the project is to be submitted to OCAFF for review prior to printing. Unmarked projects may be submitted through the proper channels to TAG for printing by the responsible Chief of Arm or Service concerned. New literature projects are indicated by N, Revisions by R, and Changes by C and the number of the Change.

Dates in the Status column indicate the following:

a. For two asterisks (**) projects, it is the approximate date the manuscript will be submitted to Director of Organization and Training for final review.

b. For one asterisk (*) projects, it is the approximate date the manuscript will be submitted to OCAFF for review.

c. For unmarked projects, it is the approximate date the manuscript will be forwarded to TAG approved for printing.

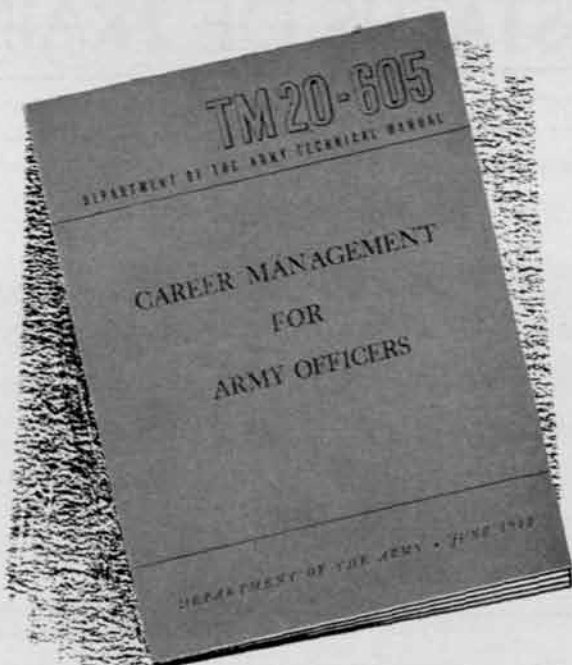
The average length of time required to print and distribute a manual, after its receipt in final form by TAG, is four (4) months.

<i>Manual Number</i>		<i>Title</i>	<i>Preparing Agency</i>	<i>Status</i>
<i>Field Manuals</i>				
44-1**	N	Antiaircraft Artillery, Employment (Revision of 4-100)	AA&GM Br, Arty Sch	OCAFF Review
44-2*	R	Antiaircraft Artillery, Automatic Weapons	AA&GM Br, Arty Sch	May 49
44-4*	R	Antiaircraft Artillery, Guns	AA&GM Br, Arty Sch	May 49
44-26*	N	Service of the Piece, 90mm AA Gun on M1A1 mount (4-126)	AA&GM Br, Arty Sch	Sep 49
44-27*	N	Service of the Piece, 90mm AA Gun mount M2 (4-127)	AA&GM Br, Arty Sch	Sep 49
44-28*	N	Service of the Piece, 4.7-Inch AA Gun (4-128)	AA&GM Br, Arty Sch	Sep 49
44-44*	N	Service of Radio Set SCR 584	AA&GM Br, Arty Sch	OCAFF Review
44-57**	C2	Adds—Transport by Air	AA&GM Br, Arty Sch	Jun 49
44-60**	C3	Adds—Transport by Air	AA&GM Br, Arty Sch	Jun 49
<i>Technical Manuals</i>				
9-372*	C2	90mm Gun and AA Mount M2	Cof Ord	May 49
9-649*	C1	AAA Cable Systems	Cof Ord	Apr 49
9-1370*	R	90mm AA Gun Matériel (1370 AB)	Cof Ord	OCO Review
9-1374*	N	90mm Guns Mounted in Combat Vehicles	Cof Ord	At Printer
9-1380*	R	120mm Gun M1 & AA Mount M1	Cof Ord	Sep 49
9-1608*	R	Periscopes, Director Sighting Telescopes & Elbow Telescopes for Tk's, MC FA & AAA	Cof Ord	OCO Review
9-1609*	N	Computing Sight M7 & M8A1 (for 40mm AA Carriage M2)	Cof Ord	OCO Review
9-1636*	N	Fuze, Setters M13 and M18	Cof Ord	Jan 50



The National Military Establishment is not irrevocably split, as critics would have you condemn it, among partisans of the several arms. We have made a start in compromising our individual requirements to construct, one with another, a security force that can best fulfill both our instant and eventual needs in the event of war. And we have learned that just as important as step-by-step sequence of fighting in modern war is the fundamental demand for complete unity in word and heart among the Armed Forces. I pledge the willingness of the Army constantly to review its requirements, so that the public need not be taxed for the maintenance of nonessentials. We do not exist to defend stubborn traditions, obsolete concepts, or yesterday's tactics. We exist to defend the Nation, tomorrow as well as today.—*General Omar N. Bradley.*

~~Favoritism
Chance
Fellowship
Influence
Mismanagement~~



Career Management For Officers*.

By Colonel J. C. Fry, Cav.

The thoughts expressed in this article represent the views of the author, and do not necessarily represent existing or contemplated Department of the Army policy.

"Thoughts are, like the stars, many reflections of a few originals."

If you have read Betty McDonald's mirth-provoking *The Egg and I*, you will recall that two amusingly indolent characters always blamed their troubles on "those crooks in Washington," where "the whole damn shebang" was operated by incompetents. Many officers who have observed or heard of unfair army personnel practices are prone to make similar remarks without contributing any particular effort toward corrective measures. For information of all such individuals the Director of Personnel and Administration has his staff busily engaged in an all-out effort to develop personnel policies and administrative procedures to insure that sensible Career Management will have a sound foundation of permanence and confidence.

It Will Take Time

The results of such work will not be evident for some time. Personnel problems cannot be treated as a fixed science. Every factor that makes up such an equation is either unknown or of variable weight. No answers can be expected that will solve every individual case. The best we can hope for are sensible policies and implementing procedures that

will be as fair as human endeavor can plan for all concerned, and which will insure a suitable safety factor to guard the welfare of our Country.

It has always been the mission of our peacetime army to have the necessary force in readiness for any wartime emergency. Congress has never allowed a safe margin of numbers and it is, therefore, of vital importance that individual ability be recognized and suitable plans made to employ personnel wisely.

The first authentic Army publicity* outlining contemplated improvement in personnel practices received worldwide favorable comment but some of the remarks have indicated a deplorable ignorance of just what influence this program can be expected to have on the future of our army or on the careers of individual officers. Letters received on the subject give the impression that the writers visualize a sort of coach and pupil program where one officer works and another monitors his career so that all can confidently expect to retire as General Officers. Unhappily for such dreams, the great white way with its myriad of stars can be trod during peacetime by only $\frac{3}{4}$ of 1% of our officers, even if all possessed qualifications to warrant such ultimate promotion.

Career Management

"Career Management" is the term employed to identify that portion of the Army's personnel program which is expressly designed to further the careers of Army personnel. It contemplates the coordination and implementation of sound personnel policies developed with the aid and cooperation of all of the Arms and Services. Although the

*Reprinted with permission from March-April issue of *The Armored Cavalry Journal*.

*(Circular 142, 1947.)

What's the matter with Career Management? Can we overcome the negative factors? Can we expect the full cooperation of G-1's and S-1's; of organization and unit commanders; of the individual officer on the receiving end of an assignment? The guide, TM 20-605 is out! Here is a penetrating analysis of the plan—of past failures and future possibilities—of a program whose effective execution will provide the potential to meet the payoff.

program will ultimately apply to all Army personnel my discussion refers only to officers.

The word "career" has been included in Army personnel plans with careful deliberation to alert officers to the fact that every order issued affects the life and welfare of some individual. The success of personnel plans depends not alone upon the wisdom of the planning, but also upon the cooperation of those who implement it and upon the insistence for fair play and continuity of the program by individual officers. Career planning by the Army does not, in any way, relieve an officer of the entire responsibility for the success of his career. It merely means that he will be afforded the opportunities to gain the experience and knowledge which are prerequisites to the attainment of a place among those officers who will ultimately be classified as qualified for high command or other positions of great responsibility.

In the past the Chiefs of Branches handled personnel according to their respective ideas. The result was continuing changes as the heads of branches retired. Every branch had different requirements and there was insufficient coordination to obtain even fair results. The failure to have coordinated policies and plans resulted in some unhappy personnel conditions, where many officers felt that assignments were made to please the whims of the Chiefs of Branches. Certainly some assignments were made to supply the need of post commanders who sought specialists to improve their own organizations and thus to indirectly contribute to the enhancement of their own official records. Without argument there were occasional personnel practices which favored the friends of cliques near the thrones and awarded undesirable assignments to the unknown or socially unimportant. Carefully cultivated friendships frequently paid substantial dividends in desirable and even profitable assignments. I suspect that there are lengthy "bull sessions" worth listening to in Valhalla where Patton, McNair, Rose, Gus Braun, Nick Craw, Darby and a multitude of other gallant souls band together to chide former Chiefs of Branches on their failures.

When we speak of an individual's career one's mind naturally turns to thoughts of emoluments and opportunities for advancement to positions of increased responsibility and prestige. Career Management plans touch but lightly on such matters. Those phases of an officer's career are automatically taken care of by Acts of Congress that determine pay and promotion. However, the plans do deal with such nebulous matters as the intent of the Department of the Army to maintain a highly competent Officer Corps, qualified to serve the nation well in event of a national emergency. Further, they seek to develop assignment patterns that will integrate the desires and qualifications of individual officers into the needs of the Army and our Country.

The basic purpose of this new personnel management

plan is to offer officers broad opportunities for professional development through wise and practical rotation of assignments. In implementing the program, the Army contemplates the use of almost every type of duty for the purpose—schools, troops, and staff. A step necessary to the successful administration of the program is the development of personnel assignment patterns to fit the specific requirements of each Arm and Service. The Career Plan would eliminate repeated assignments to the same type of duty and substitute greater opportunity for deserving officers to experience practical staff and command duties. It contemplates a standard procedure of advancing responsibility where officers habitually serve as understudies or assistants before being given positions of primary responsibility. Further, the program would reduce to a minimum the influence of bias and favor on the careers of individuals and in the interest of welfare of the Army and our Country it seeks to broaden the horizons of opportunity for all officers.

The essence of the entire Career Program is the *wise rotation of assignments* designed to afford officers opportunities in proportion to their capacities for professional development. Each Arm and Service should develop assignment patterns to fit its special needs, the Department of the Army only exercising the degree of staff supervision and control required to insure the necessary coordination. The plans under study would give permanence to assignment policies that have long been acknowledged as right and proper. "In time of peace, prepare for war." Specifically, the objectives are:

To develop the professional capacities of officers to the highest ability levels that can be achieved by intelligently planned and progressive rotation of assignments.

To give to all officers on the basis of demonstrated merit equal opportunity for selection, promotion and preferential assignment.

To insure that officers are classified according to their qualifications and that such qualifications are a matter of record.

To develop an administrative plan that will be ready, in event of a national emergency, to insure the procurement and proper allocation of personnel in accordance with their qualifications and in proportion to the relative need for each task.

Need For Career Management

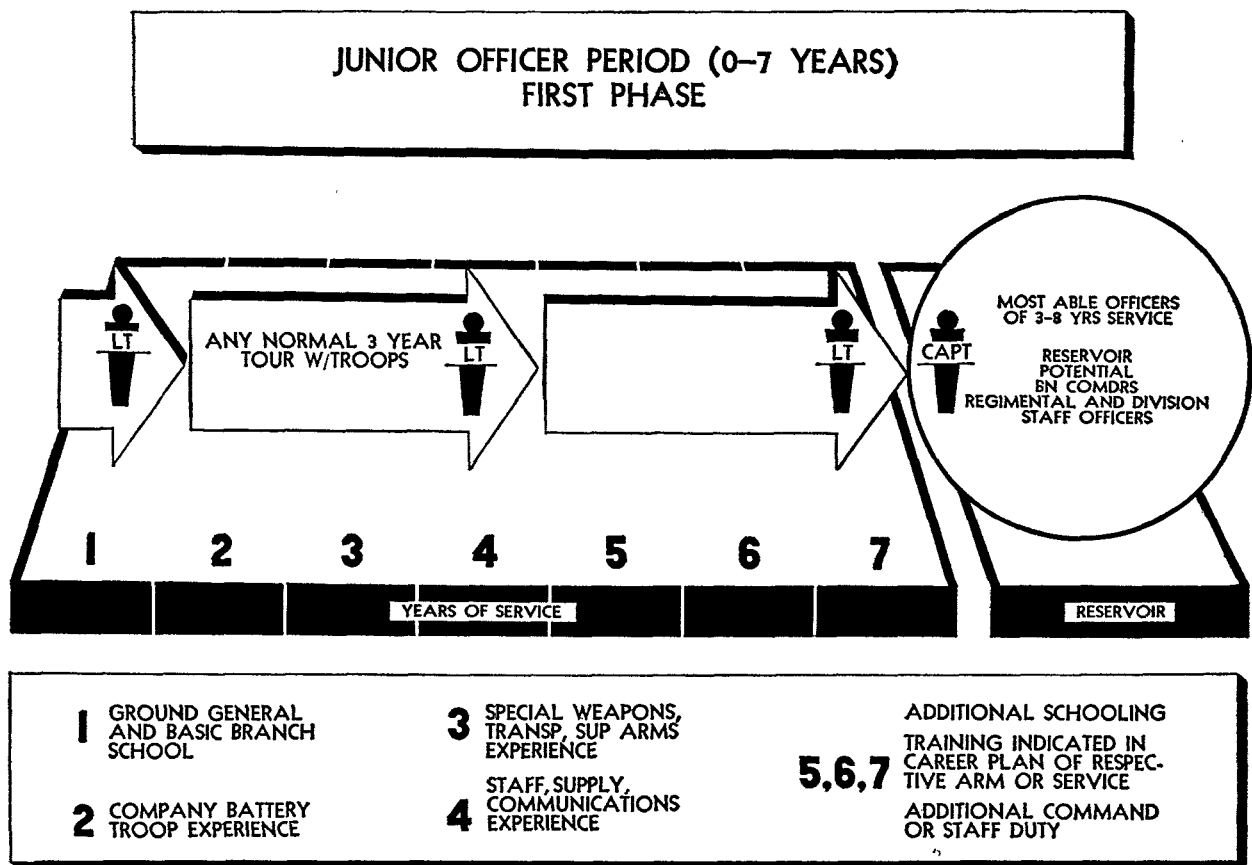
Does the Army need a Personnel Management Program—i.e., Career Management? This natural query can best be answered by other questions. Is it desirable to employ personnel in accordance with the needs of the Army? Should we endeavor to fit the special aptitudes of individuals as accurately as possible to the duties they will be expected to perform? Is it preferable to make personnel assignments by careful analysis of individual qualifications or should we

evade this task and leave matters of such importance to chance, to the initiative of the individual concerned, to the urgency of requirements or perhaps to the sponsorship of seniors? Surely no one can study past personnel practices or contemplate our future problems without inner conviction of our great need for scientific planning. There have been many examples where individuals have progressed, failed or have been forgotten because of the lack of necessary controls. Chance took care of some. Initiative, personality and force of the individual took care of others and the sponsorship of seniors took care of many. Such a program gives little assurance that the individual of ability will receive recognition in accordance with his qualifications nor does it fit into our democratic way of living.

Any attempt to improve personnel planning within the

The history of past accomplishments fails to support such an optimistic attitude. I prefer to think that there are definite reasons why attempts of this nature have failed rather than to make a blanket indictment of all former Army G-1's. There were administrative ills that no one ever succeeded in curing. We must determine what sabotaged past attempts and avoid those dangers as we would a plague. I believe that the answer could be diagnosed as a lack of coordination between the many branches of the Army. Every G-1 has had the background of some Arm or Service. It is only natural that their thoughts should have been molded by their basic training. The final solution—if it is to survive—must fit the needs of all Arms and Services.

Without definite plans to control assignments no progressive professional development can occur except by chance.



Department of the Army has frequently met with a negative reception from the senior officers on whose shoulders will fall the task of implementing the policies of the Director of Personnel and Administration. The impetus now being given to personnel planning is what is needed—a fresh start based on original thought. There is scarcely any limit to what can be accomplished if our leaders understand and translate their approval into active supervision. Not long ago I listened to a long criticism of personnel policies by a very senior officer. The remarks ended with the comment, "It is a damn shame. Someone should do something about it!" What? When? Who? These were problems left to the initiative of others. On another occasion a senior General Officer made a broad statement that ended in a typical generality. "There is no need for elaborate plans. If G-1 wants career guidance it can easily be accomplished—we have command channels for such purposes."

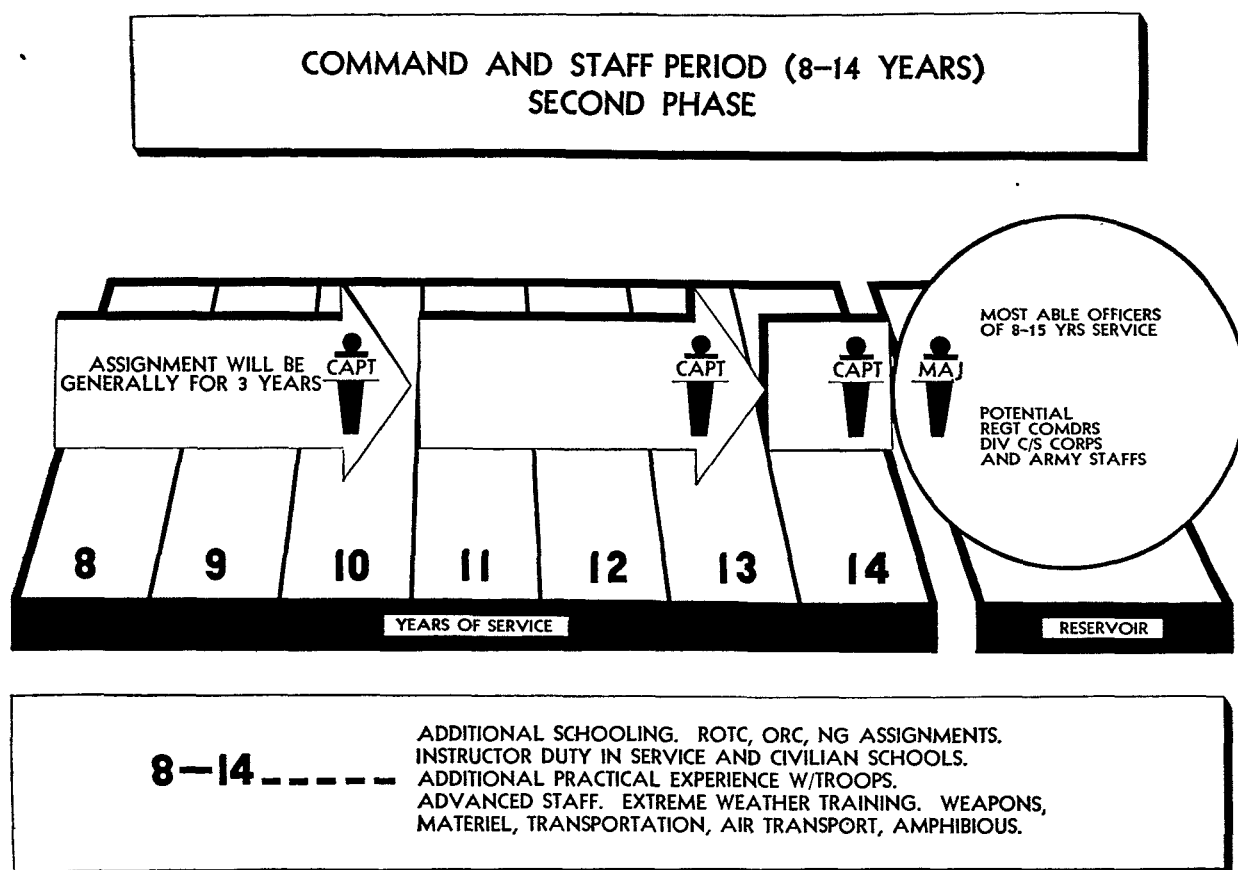
The pattern of past practices indicates that no system of assignments guides was ever established or followed. If there was any plan to fit officers' qualifications to the needs of the Army it must have been scrapped at the beginning of the war. On this theme almost any older officer can recite dozens of cases of mismanagement. General Wedemeyer attended the German War College and there were probably few of our senior officers who had an equivalent opportunity for acquaintance with Europe. His wartime assignment was in the Orient. General Max Taylor was a Japanese language student and hence must have possessed more than average knowledge of that part of the world. He commanded the 101st Airborne Division in Europe. I was one of the small number of officers who helped create the original Philippine Army and am intimately acquainted with much of the terrain where our troops destroyed the Japanese forces. I fought with the 88th Division in Italy. Colonel Joe Cleland

is perhaps the only officer of the United States Army ever to drive a car across Turkey, Syria, Iraq, Persia, and Afghanistan. At a time when our Army desperately needed representation in the Middle East he was placed on attaché duty in South America. And so on, ad infinitum.

No personnel management plan can be developed that will be able to furnish answers for all the questions that will confront officers detailed to develop sensible career patterns. However, thoughtful assignment procedures will give a logical solution to nearly every problem. Consider the future of a young officer assigned to study a foreign language. Under past policies this assignment might well have been followed by duty as Post Exchange Officer in any locality. The original selection of students for assignments of this nature should be made from volunteers who seek to follow

Those officers who approach such matters with indifference or who are willing to drift into procedures followed by their prewar predecessors are out of step with the times. In my opinion they are truly "old fogies." In terms of our younger officers they are the ones frequently described as being dead but who have not, as yet, been transported to the cemetery.

In retrospect it seems absurd beyond words that the fine regiments in existence before the war were not used to capacity to train potential combat leaders. I am undoubtedly an exception, but of all the Regimental Commanders under whom I served before 1940 not one occupied a position of command during the war. Many of the officers who recently served as combat division commanders with limited benefit of troop command, could have had the seasoning of assur-



definite career patterns. Common sense would seem to indicate that such study should be followed with a tour of duty in the country of the officer's interest. A logical assignment might be as an Assistant Military Attaché. Following such a detail the next step would be to convey the knowledge of the country and the experience gained to the Department of the Army by service with our Intelligence Division. Following this the officer should be given an assignment with troops to improve his knowledge of the combat method we would employ, of our resources and the progress made in the development of military matériel. Thus every successive change of duty has a clear-cut relation to the past and a proper consideration of the individual's wishes and future value to the Army.

To question the need for improved personnel planning is as absurd to me as to argue the need of keeping abreast of tactical doctrines or the improvement in military weapons.

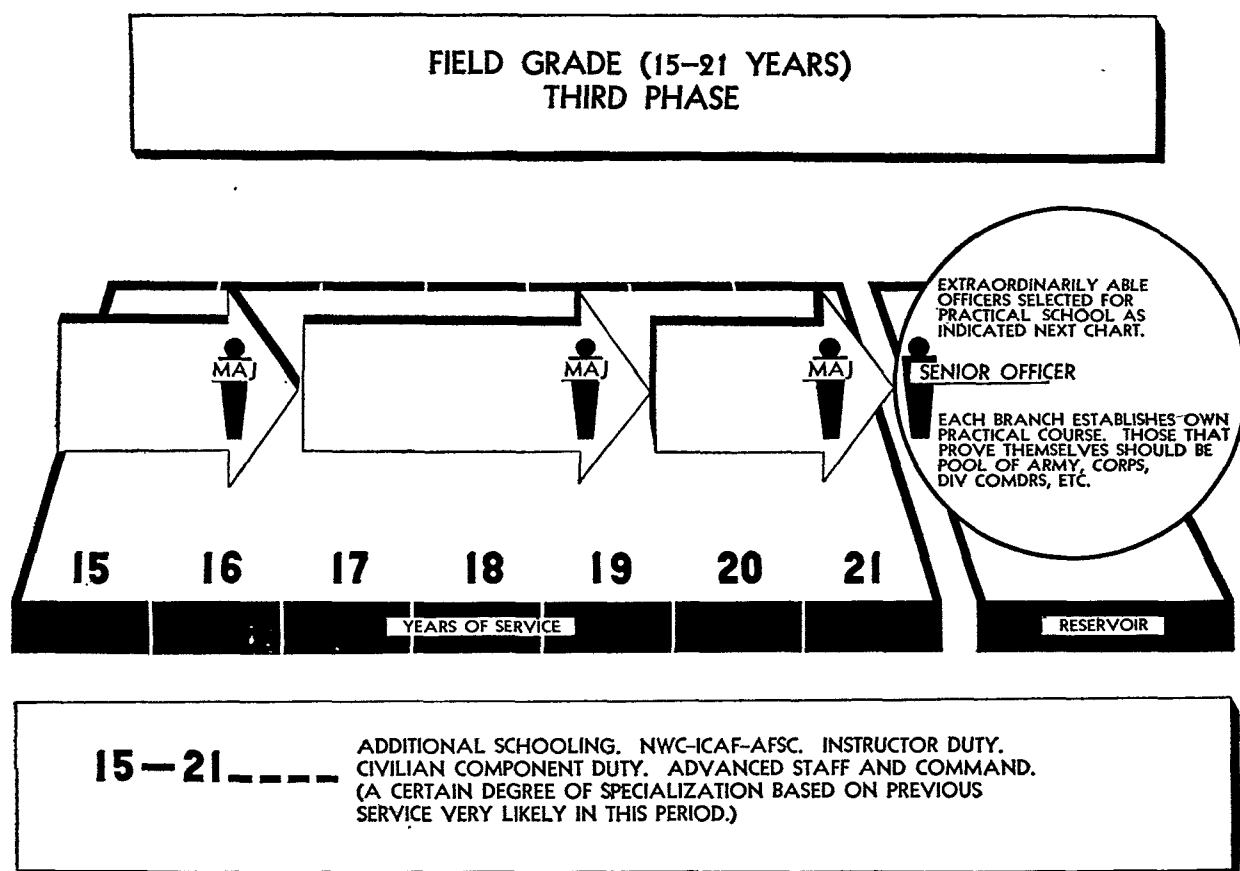
ance, confidence and experience which comes only from actual command. Let us hope that we shall never again waste such golden opportunities. During a national emergency our interest is in the man who can produce results. Diplomas have very little tangible value. *Why should so much thought be given to the theoretical training in schools and the opportunities for practical training be almost totally neglected?*

Every older officer can recall commands that were used for the personal glorification of the commander. The emphasis on unit efficiency and the almost complete indifference to the desires of individuals to be allowed to perform duties that would help their professional development; the wasted hours devoted to painting transportation for horse shows; the seasonal whitewash beautification of rocks and trees; the reams of paper and hours of clerical work devoted to securing unauthorized white crossed belts and spats for Regimental

bands; the officers who spent year after year performing the same duties, running Post Exchanges, supervising athletic teams; and a thousand other tasks that contributed little toward their over-all qualifications! I was personally involved in a project to dye all of the mules of one Regiment. I was never given the confidence of the Commander but presumably the famous Black Horse Troop was to be surpassed by a more famous Black Mule Regiment. Every branch of the service had similar experiences. Professional Adjutants were to be found everywhere. Many knew little except their regulations and during the test of war were quickly relegated to inconspicuous and unimportant roles. Every type of work had its specialists who could do little else. A large percentage of the officers who failed ignominiously during the war came from such groups. War is the

peacetime commander must be recognized. His task is that of developing the professional qualifications of his officers and men and not beautification of the post or to have a command capable of functioning perfectly with the personnel on hand. Officers and men should be given an opportunity during peace to prepare for the job they would probably be called on to perform in event of war. The true test of any commander should be his knowledge of training methods and his ability to develop and round out the development of those individuals marked for future positions of responsibility.

The principle enunciated in the previous paragraph has already met stern opposition by officers engaged solely in the planning of training. Such opposition merely indicates the difficulty of putting one's thoughts into understandable com-



pay-off and it is then that the leader needs the confidence of practical experience. As I seek concise arguments to emphasize the importance of such assignment control, I am reminded of the remarks on the record of a brilliant officer who was relieved in combat. "Through no fault of his own General has never served with troops since he was a company officer. He has been unable to adjust himself in the conditions of modern combat." I have no way of knowing whether or not the comment was warranted but anyone who has commanded troops in battle can appreciate the possibility of an officer failing for just such reasons. *In cold terms of truth many men died because we did not use to capacity all of our means of practical training.*

We must destroy the idea that peacetime commands have a single goal, which is unit efficiency. Few organizations will ever enter combat with any considerable part of the personnel who fill its ranks during peace. The real job of the

position. I am confident that the personnel plans which I am attempting to outline in this article would produce results equally as good as those desired by officers who prefer to emphasize the unit instead of the individual. To the proponents of unit efficiency I make the suggestion that they study carefully the history of those organizations which were destroyed, but rose again to fight in battle because the surviving leaders were prepared by practical experience to train new organizations. The units officered by individuals possessing a sound foundation of practical experience can be expected to perform with greater brilliance than one serviced by officer specialists who have never had an opportunity to prepare themselves for the problems that they inevitably encounter outside their own narrow fields. Remember, there are poor leaders but there are no poor regiments. In our prewar establishment many officers served a dozen years with troops while others had little or no opportunity

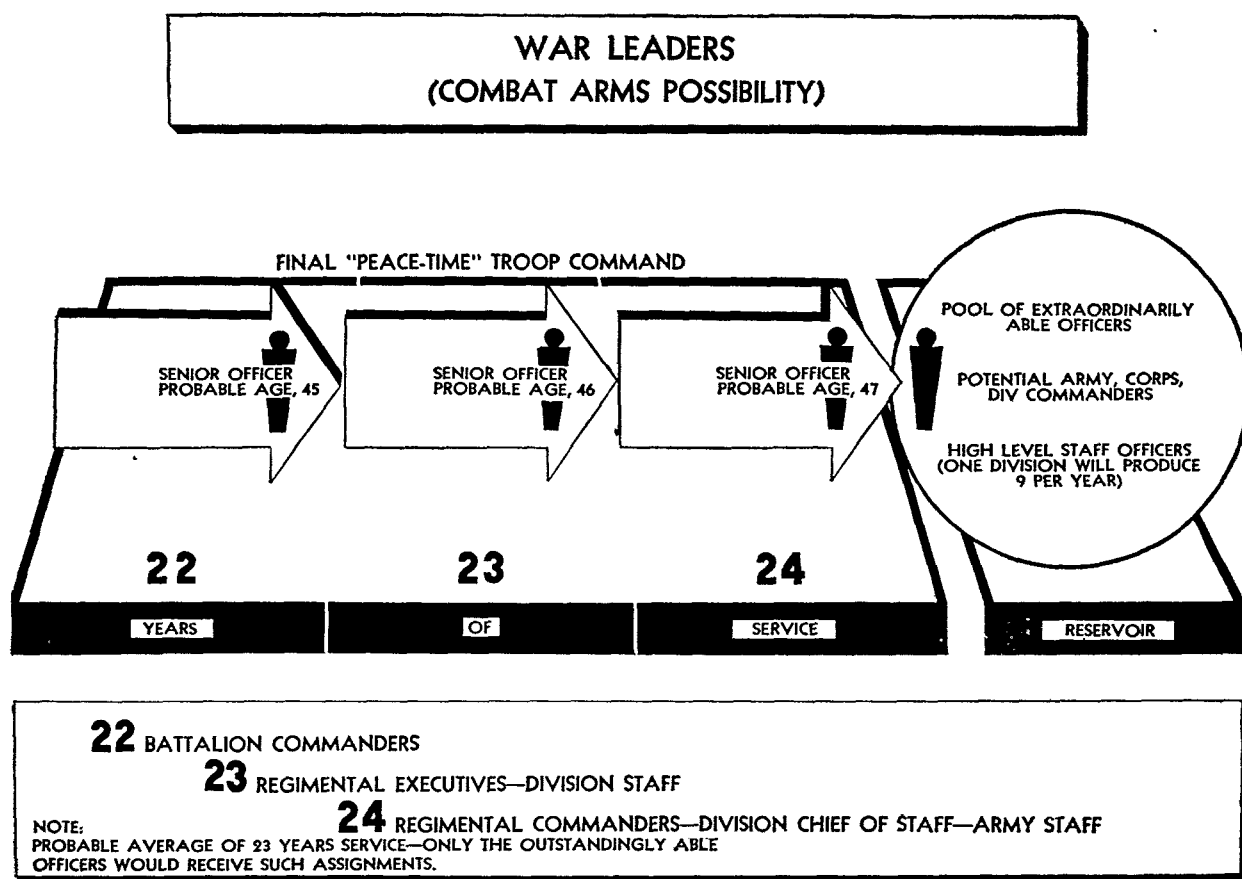
for troop experience. At least one officer who reached Major General rank had never commanded a unit larger than a platoon, and the experience of a multitude of others was restricted to little more. All credit to those officers for their ability to overcome these hurdles but there can be little doubt that fewer white crosses would now be overseas or that less criticism would have been leveled at the "brass" if our peacetime military establishment had been used to capacity to give officers a better understanding of the qualifications and limitations of individuals as well as a clear picture of the potentiality of our matériel.

Personnel management—as the term is used in the Army and in Industry—indicates an improved status for individuals. Like all advancements of this nature that have been made throughout history, the gradual changes have resulted

barrel before our enemies were defeated. *The possible war of the future could bring defeat to our country unless our personnel plans are such that the full potential of this most important resource can be realized.*

Civil Life Parallel

If we pause to compare our personnel plans with those of civilian industry, we find some interesting parallels and some obvious reasons why military personnel planning has frequently been out of step with that in civilian life. Industrial organizations are owned by individuals or groups of individuals and these persons naturally move to the top positions of responsibility and remuneration. Here we have the sponsorship of individuals which is certain to always flourish in many walks of life. However, in spite of this



from a direct need. The student of war can find a thousand books which will describe the advancement and development of weapons from the crossbow to the atom bomb. Our military schools have taught and demonstrated the application of the Principles of War. Our research has sought with what funds were available to surpass our enemies in the development of potential combat tools. In our war plans the natural resources of our country have received suitable study. The transportation facilities and the problems of logistics are subjects that have always received appropriate consideration from our General Staff. In short, of all the elements that must be coordinated in the successful prosecution of war, the most important ingredient—the individual soldier and officer—has received the least attention. The professional development of the individual was left more to chance than to the application of logical management. World War II took us almost to the bottom of the personnel

there has been throughout the years, continued improvement in democratic personnel practices that warrants thoughtful study.

The steady improvement and advancement made by industry has been due to the combined desires of the individual to improve their lot and to the needs of management to find efficient production methods. Individual workers grew tired of systems where power was left in the hands of minor bosses who frequently depended upon their brawn to enforce discipline and whose family, relatives, and friends occupied the most desirable positions. (Not unlike some personnel arrangements that have at times existed in the Army.) Labor movements throughout the country have steadily insisted upon increased consideration of individuals on the basis of ability and the result has been consistent advancement toward the wise utilization of personnel. To meet the demands of labor and in accordance with the democratic

habits of our country, industrial leaders have recognized the wisdom of employing personnel according to their capabilities. The assembly lines which reached full development in our automobile industry proved that it was a matter of efficiency and increased financial dividends to utilize men on jobs for which they are best suited and to train, guide, and employ individuals according to their special aptitudes. The result has been consistent improvement of personnel management methods throughout industry. Sensible administrative procedures have succeeded in gearing the desire and qualifications of employees to the needs of commercial organizations. This is exactly what the Department of the Army seeks to do through its plan of career management.

If we investigate further the methods employed by civilian industry we discover that the importance given to personnel management is in direct proportion to the size and efficiency of an organization. Examples would include Vice Presidents in charge of personnel who are responsible only to the President of the organization. (Such administrative methods parallel the Army organization where the Director of Personnel is responsible to the Chief of Staff.) Civilian personnel managers must know the need of their organization, and the qualifications required of employees, and are responsible for the recruitment and individual training of personnel which they furnish the using agencies. In this respect our military administrative organization differs from the civilian counterpart in that it divides its responsibility for personnel. Training of every degree is made the responsibility of another Division of the General Staff. To my way of thinking this is a weak spot in our personnel management program. My personal views are that we have need of improved administrative procedures to allow personnel officers greater latitude in matters involving individual training.

While workers in industry were insisting on pay scales commensurate with their qualifications, and employers were endeavoring to get the greatest return for their investment, army personnel planning lay dormant due to lack of incentive. With pay and promotion beyond the influence of individual efficiency and with no immediate emergency to interfere the Army drifted complacently through the prewar years. The war brought the defects of our personnel planning into the glare of public opinion. Unjust criticism made the headlines of our newspapers more often than the practices which needed correction. From certain wartime mistakes it was easy to deduce that the Army need to follow the lead of civilian industry. The first change initiated subsequent to the war was a promotion plan designed to recognize individual merit by selective promotion. The next step should logically be the implementation of personnel policies to insure that the Army takes full advantage of the inherent qualifications of our personnel.

The Cutting Edge

As we pursue our routine and frequently prosaic peace duties we all too often forget the purpose of all personnel management. During war our fighting force is a very thin blade supported and driven home by the weight of industry and our human resources. The decisive and final struggle on land has always been decided by the ground combat forces. The black lines on operations maps merely measure the progress of our fighting men along the road to victory.

On the ground there is nothing in front of the soldier except the enemy. These are the men in the forward areas whose battles are won with brains and fighting hearts. The most compelling need in every war has been for the front-line fighter and his leader.*

The Career Program would insure that all officers have a proper appreciation of the capacity and limitations of human beings as well as full knowledge of the potentialities of available matériel. There is no type of human endeavor where it is so important that the leader understand all phases of his job as that of the profession of arms. Everything concerning a soldier's existence: his ability, potentiality, and professional knowledge, as well as those matters which influence his personal welfare; his food, clothing, comfort, promotion, and in time of war his very life, depend upon his commander's knowledge and appreciation of the importance of all phases of his work. The planned professional development of our future leaders merely represents insurance that our troops are ably led in event of any future war.

There will be a continuing need throughout the years of peace to screen and select the leaders who will guide our armed forces in event of war. *No officer of ground combat arms should ever be promoted to the rank of colonel or higher who has not demonstrated the ability to command troops.* If such a policy was emphasized in our Career Planning a desirable number of our ablest officers would seek command responsibility. This is surely desirable. The Army exists to destroy the combat forces of our enemy and it seems as absurd to promote an officer to general officer rank who has never commanded troops, as to elevate a naval officer to flag rank who has never been to sea. Such matters should not be left to chance or to the conditions of near hysteria which might prevail if our country were attacked by a foreign foe.

How Does Career Management Affect You?

Personal Management policies are usually well received provided the planning is restricted to generalities. Most officers will agree upon the wisdom of insuring that individuals are afforded broad opportunities for professional development and that there should be administrative procedures to record individual qualifications so that officers may be employed profitably and effectively in the event of war. However, plans cannot possibly provide assignments that will please everyone. The question that inevitably bobs to the surface of any officer's mind who considers the subject is, "how does this affect me?" Individual desires for personal and preferential treatment will always be a problem requiring moral courage on the part of personnel officers. The reactions of many officers will be that it is all very well to have "fixed" policies providing an exception can be made in their case. Of course officers should take their turn at undesirable assignments. Sure—it's a good thing for all officers to serve a detail with civilian components, it is bound to give an officer a better understanding of those who inevitably bear the brunt of any war. But when it comes time for such details there are plenty who want to be excused. They prefer to stay within the personnel groupings where their qualifications are known to the officers who can in-

*This thought is emphasized in a wartime statement by Lt. Gen. Lesley J McNair (killed in action).

fluence their future. Such officers will reluctantly relinquish their program for advancement through sponsorship of the seniors with whom they are acquainted and their private plans to ingratiate themselves with others in high places.

The successful implementation of any new personnel policy depends upon understanding by those who have to execute the plan. Career Management must be implemented by directives that require officers of all echelons to support and improve by intelligence and imagination the assignment patterns outlined. To prove successful the following administrative steps are needed:

a. Career Management must be made a command responsibility under the appropriate Army Regulation governing assignment procedures.

b. Personnel officers must follow the personnel policies outlined in TM 20-605, Career Management for Officers.

c. The Career Management Program must be a continuous subject for inspection by The Inspector General. This will afford field commanders an opportunity to make pertinent recommendations for the improvement of assignment policies and will acquaint the Director of Personnel and Administration with the problems of field commanders and progress being made in personnel management.

A suitable text has already been published. It is not expected that the first Manual on the subject will prove to be a masterpiece but it should put the career program on a sound foundation of reality. There will be ample future opportunities for revision and improvement of the plans outlined. The basic concepts, as outlined many times in preceding pages, have been followed closely. Every personnel section of every branch of the Army has participated in the preparation of the Career Patterns that are included as assignment guides.

In the first phase outlined in these assignment patterns the young officer is taught the basic principles of his branch and then allowed to apply theory in practical work. This is an internship which is the foundation upon which his future will be built. During this period he acquires the knowledge of the tools with which he is to work and upon which his success or failure depends. The information gleaned will determine his future actions as he serves in positions of greater responsibility. This is the time for the young officer to learn how much an individual can endure; the strength and the weaknesses of the individual soldier. It is also the time to learn the potential that exists in our matériel, the real reason for the existence of any Army, and what must always be the inevitable price of victory.

In the second phase officers establish their aptitude for certain specialized assignments by actual performance of duty. They receive additional schooling, assignments with Civilian Components of the Army, and additional practical experience with troops, advanced staff duties and special operations.

The third phase of an officer's career is determined chiefly by his interest and background, but subject to the limitations of position vacancies. Through planned consecutive assignments, on-the-job training, special school courses and tours of temporary duty with allied industries, many can be given opportunities to be developed as specialists in selected fields. The specialist classification cannot, however, be absolutely rigid since any officer at any time should be equipped gen-

erally to perform any task appropriate to his rank and experience.

The last phase is especially designed to maintain the highest standards desired for unit training. The ablest officers are tested in qualifications of troop command and selected officers are given a final opportunity to check their knowledge of the possibilities of our matériel.

Career monitoring of assignments will cease for most officers on completion of 21 years of service. Top level military schools will be completed and most officers will serve their final peacetime assignment period with troops. Most important will be the indexing of these field officers for emergency assignments.

Beyond the career monitoring period some few selected officers could be given important positions of primary responsibility. These will be the officers who are the potential leaders of any immediate emergency. This should be a final screening and testing period for potential high commanders.

The Career Manual as conceived should be the constant reference and guide for assignment officers of all levels. It should bring to an end the activity of bookkeepers who have long masqueraded as personnel officers. Instead of filling vacancies with men who were already proficient in the task to which assigned, these officers would be forced to use imagination and intelligence to develop personnel by affording opportunities for officers to learn new duties. It will give to S-1's and G-1's greater responsibilities and if the written word is supported by force and imagination, the results are certain to greatly improve the professional stature of our entire officer corps.

The assignment pattern covered in the Career Manual is broad. There are 11 years of controlled assignments during the first 21 years of service. These include the Basic Officers' Course, the Advanced Officers' Course, 6 years of troop duty and 3 years' service with civilian components. As such assignments are supplemented by other duties that must be performed by the officer corps, individual qualifications should become evident. In the personnel sections the records should be the subject of continuous study to make certain that proper weighing is given to the desires of the individual officer, and the demonstrated qualifications are fitted to the needs of the service.

To Make It Work

So it is a fine idea! But how do we make it work? There is no doubt in my mind as to the compelling need for military personnel management. If the imagination, initiative and ingenuity of our military seniors can be guided along the lines I have indicated we will have overflowing reservoirs of capable officers to supply the necessary leadership in event of another emergency. The immediate problem is to secure the desired understanding and appreciation by those who have for years given first priority to Plans and Operations and secondary considerations to Personnel. The implementing directives, which launch Career Management, will have to be clear, concise and forceful and such that will fit into our schemes for National Defense. The publication of the necessary regulations and manuals is a mission worthy of the ablest writers.

It is imperative that the importance of personnel planning be emphasized by continuous repetition. Our officers are ac-

customed to training directives. If a General Officer is assigned to the command of a division, he is immediately concerned with the efficiency of the unit. He can be expected to follow with intelligence and imagination the instructions outlined in training Manuals and to exercise the ingenuity required to get the desired results. To get the same commander to adopt personnel policies that need to be correlated with training methods will require more than normal emphasis at the outset. To repeat myself, the mission of developing the professional capacities of the individual members of a command must be a command responsibility, just as the efficiency of units is now an accepted training requirement. Once commanders on all levels appreciate how important sound personnel management is to the success of our peacetime mission, there is no doubt of the cooperation or degree of loyalty that will support the program. It will be a great day for the Army when commanders sum up their annual accomplishments in terms of leaders they have developed instead of exuding inward satisfaction over silly minor accomplishments such as winning some local rifle contest or transportation show.

The planned development of military personnel will prove equally as interesting as tactics or strategy. However, the initial success of the career program can be unjustifiably delayed by lack of appreciation of the problems involved. Every school has a limit to its capacity. There must be teachers as well as students and this fact is occasionally forgotten by the new enthusiast outlining "on-the-job" training. Every T/O position cannot be filled by a neophyte. A student may become a teacher but his efficiency will depend upon how well he has learned his subject. In short, a successful career management program must insure progressive advancement through each phase of training. There is nothing particularly new about such a scheme. The plan I have attempted to indicate merely contemplates suitable control of assignments to insure that they are made solely on the basis of capacity and the need for knowledge or practical experience.

To use a nauseating phrase that grew out of the war, the final hurdle will be "the Top Brass." The successful appli-

cation of plans that are at present little more than dreams will depend upon understanding and the energetic support of our military leaders on all levels. The maximum opportunities should be created during peace so that broad military knowledge may be absorbed by all potential leaders. However, this fact has frequently been forgotten and many commanders have wasted precious time developing to a high level of efficiency a puny peacetime war machine, with little thought as to how it must be altered to fit the needs of war.

If sound personnel management is to span the abyss of indifference that has grown throughout the years, and is to be something more than a dream, the implementation of personnel management must be supervised. Time is the essence of war and we cannot afford to allow indifference to interfere with our plans. Our most critical shortage will always be individual leadership and our most important peacetime mission is the development of those qualities in our Officer Corps. "That which is not inspected will not be respected." Field execution of Career Management directives should be a continuing subject for inspection and report by representatives of all higher headquarters.

Every commander must be trained to look beneath the veneer of any organization and to evaluate the degree of actual accomplishment. If a commander refuses or is incapable of recognizing personnel development methods; if everything "must click" at all times, then it is a foregone conclusion that subordinates whose future depends upon their superiors being pleased will take steps to satisfy the individuals concerned—at the expense of their junior officers who should have an opportunity to learn their trade. Let our top commanders establish the proper patterns by requiring a flow of officers through the many positions in their own headquarters and then requiring subordinate commanders to do likewise. Let all inspections be conducted with suitable emphasis on the opportunities afforded individuals for broad professional training and in a manner to kill the aspirations of those who would prefer to depend on eyewash. Water rises no higher than its source. The success or failure of any project will always depend upon the Boss.



29 West Pointers to CAC

The following named members of the 1949 graduating class at the United States Military Academy are being commissioned in the Coast Artillery Corps:

G. M. Crall	S. V. Ellerthorpe	J. R. Hayne	R. D. Rosenblatt	R. S. Craig
F. J. Fritz	J. O. Vogel	J. J. Paden	A. V. Scarione	J. M. Sayler
W. O. Ware	J. E. Poore	J. A. Whitmarsh	C. S. Colson	E. B. Mechling
R. C. Barlow	R. W. Howell	J. E. Muckerman	D. V. Braun	D. G. Freeman
G. X. Cheves	R. K. Dalrymple	J. E. Ryan	E. S. Marks	J. B. Latimer
J. C. Burckart	W. E. Marfuggi	D. J. Colgan	C. L. Smith	

Coordinated National Guard-ORC Week-End Training

By Lt. Col. William P. Robinson

Regular Army, National Guard and Organized Reserve, with Naval and Coast Guard cooperation, prove practicability of week-end refresher training for civilian components at Fort MacArthur.

Would you believe that a man could possibly forego lazy week ends at home and enjoy working in the mud and rain for nine straight week ends without thought of pay?

It sounds crazy—but it happened. Seventy-five officers and enlisted men of the ORC and California National Guard did just that! They worked together for two months, voluntarily and without pay, in an intensive refresher course in the operation and firing of 90mm guns.

It happened at Fort MacArthur where the guns were emplaced and operated simultaneously by the ORC and National Guard. The guns were hauled from the National

Guard Armory at Long Beach each Saturday morning and returned each night.

The National Guard and the ORC Training Center provided the M9A1 director, SCR 584 radar, BC telescopes, telephones and other equipment.

Arrangements were made with the Navy to clear the seaward area for firing and to issue warnings. The Coast Guard cooperated by towing the target at ranges varying from 3500 to 5000 yards. Five hundred rounds of M77 armor piercing 90mm ammunition was obtained for the firings. As the director was designed for the M71, high explosive ammunition, the problem of correcting for the difference in the two trajectories, coupled with a correction for a 150-foot height of site, proved most interesting and instructive to the members of the ORC.

After the first sixty rounds were fired a tentative range-elevation curve was plotted for the M77 ammunition with the 150-foot height of site. Comparing this with the similar curve for the M71 ammunition for which the director computed data, indicated corrections should increase as the range



90mm gun emplacements for special training firing. Reserve Officers' unit in the foreground and National Guard unit in background.

Signal Corps Photo.

increased. The only corrections available on the director which met this requirement were muzzle velocity, density and per cent range. With all these at their full limit, the director still lacked nine mils of furnishing sufficient quadrant elevation at 4000 yards range. It was desirable to commence firing with a zero quadrant elevation spot so that some means would be available for reasonably small range adjustments. Therefore a vertical parallax was set into the director to make up the nine mils that were lacking. By plotting the range-elevation curve, which would be computed by the director with all these corrections set in, it was found that the computed data would stay within 2 mils of the range-elevation curve of the M77 ammunition from minimum ranges to about 5100 yards. The data thus computed were used during the rest of the firing and it was never necessary to use a quadrant elevation spot greater than 6 mils.

During the target practice, two different methods of obtaining data were used. For the first five weeks, the radar was used for range data only and the tracking head was used for azimuth. The elevation scope was set at zero, and the height of site taken care of with a vertical parallax correction on the computer. For the last four weeks, the radar furnished all present position data. The tracking head was used merely as an added safety precaution, by matching pointers to make sure the radar stayed on the target. The first method was found to give much steadier data and the guns were used in remote control. During the use of the second method, even using the 20-second data smoothing network, it was found necessary to match pointers manually at the guns because of excessive oscillations of the transmitted data. The men matching pointers averaged out these oscillations and maintained smooth tracking at the guns.

Considerable difficulty was encountered in keeping fall of

shots of the two guns together. This was due to the shifting and settling of the mobile mounts while firing at this low elevation. It was found necessary to re-level and re-orient the guns after each firing course. Analysis of the shoot showed no calibration corrections were required.

Three targets were destroyed during this practice by actual hits and 19 per cent of all rounds fired at the targets landed within 10 yards. From the standpoint of gunnery, this was considered an excellent shoot.

A résumé of the practice brings out the fact that Reserve officers need a "Refresher"; that actual practice in firing guns is good for the morale; that such a practice increases classroom attendance (as evidenced by an increase in attendance to 76% of total strength); that cooperation between all Services is possible, and when accomplished, makes for a mutual respect among the Services.

The firing unit was under the command of Colonel William Sells, CO, 6619th AAA Training Group, ORC, assisted by Lt. Colonel Glenn A. Duke, CO, 720th AAA Gun Bn., California National Guard. Executive officer for the firing was Colonel Don E. Kates, CO, 6620th AAA Training Group, ORC, with Lt. Colonel Julien Charle, ORC, Assistant Executive and Major Edward Lynch as range officer.

Brigadier General Leroy Watson, Commanding General of the Southern Military District, made equipment and facilities available and Lt. Colonel James Baker, ORC Artillery Unit Instructor, worked out the coordinated training program.

To the National Guard goes much of the credit for the success of the practice. To Colonel C. F. Byers, Lt. Colonel Glenn A. Duke and Lt. Colonel W. T. Lyman, Executive Officer, 234th AAA Group, California National Guard the appreciation of a job well done. Without them the practice would have been impossible.



National Guard Commanders Attend Refresher Course

A special refresher course for command and staff officers of the 27 National Guard divisions was given again this year at the Command and General Staff College, Fort Leavenworth, Kansas, according to Major General Kenneth F. Cramer, Chief of the National Guard Bureau.

A total of 211 National Guard officers, from captains to major generals, and 22 Regular Army instructors were authorized to take the course, the third since postwar reorganization of the National Guard. Last year 163 Guard officers attended.

The course, from April 10 to 16, inclusive, covered command and staff procedures and actual problems involving staff work and decisions.

THE TURBO-JET*

By E. S. Thompson

The constant urge of airmen to fly faster and faster has received a tremendous impetus in the past few years because of the creation of new modes of aircraft propulsion. Spurred on by the war, the development of the turbo-prop, the turbo-jet, the pulse-jet and the rocket has now reached a stage which prompts many to believe that the present forms of aircraft propulsion are outmoded. Careful analysis will show that this is by no means the case.

One of these new engines, the turbo-jet, is making a bid for a large portion of future aircraft installations. It has now established itself as a dependable aircraft power plant and its characteristics appear ideal for many applications.

It is the purpose of this article to evaluate the turbo-jet with respect to other types of aircraft power plants. Many features of the turbo-jet will require modification and further development and perhaps a somewhat new concept of design will be necessary before the turbo-jets can claim their rightful place in the aircraft field.

In order to establish the position of the turbo-jet with respect to aircraft speed and range, it will be desirable to review briefly each type of power plant suitable for aircraft propulsion. An estimate of the maximum effective speed attainable by aircraft equipped with various types of power plants is shown in Figure 1. Generally, the speed of an airplane increases with increase in altitude as long as the engine power can be maintained at its maximum value by supplying excess air or supercharging in the case of the reciprocating engine, or by maintaining the highest design compressor pressure ratio in the case of the gas turbine. The power of rockets, which do not depend upon atmospheric air, is not affected by change in altitude.

The reciprocating engine which must get along on the air it can suck in, can be brought up somewhat below its cellar position on the speed scale by the addition of an air pump driven from the engine crankshaft. Addition of a supercharger driven by a gas turbine to this type of engine allows full power operation at even higher altitudes resulting in a gain in maximum speed. A further increase in speed may be obtained in the reciprocating engine and propeller-driven aircraft by directing the exhaust pipes rearward so as to utilize the thrust from the exhaust gases. The maximum effect from the exhaust gas is obtained by using separate jets for each cylinder, or at the most by combining the exhaust gas from two cylinders.

Installation of an exhaust-gas-driven turbosupercharger within the nacelle or fuselage in such a position that the exhaust from the turbosupercharger is in a horizontal direction opposite to the line of flight allows very effective use of the residual velocity of the exhaust gas in increasing the combined thrust of the power plant. As altitude is increased the

ratio of the thrust available from the turbosupercharger exhaust becomes a larger percentage of the total engine power. Airplanes equipped with this type of power plant are capable of speeds of approximately 500 miles per hour. This speed limitation will be increased somewhat when new developments now under way result in acceptable propeller efficiencies at speeds above 500 miles per hour.

The turbosupercharged power plant does not utilize the entire flow of exhaust gas from the reciprocating engine in the turbosupercharger but wastes a considerable portion of the gas through a valve or waste gate.

Development work and flight testing have been in process for some time on piston engine-gas turbine cycles, which utilize much higher percentages of exhaust gas energy than does the conventional turbosupercharger arrangement. These new schemes are called "compound engines." One of them is the Pratt & Whitney-General Electric VDT (for variable discharge turbo) power plant, a piston-jet propulsion combination which delivers more than 4,000 HP to a propeller, plus several hundred pounds of jet thrust.

The VDT has performance characteristics that make it one of the outstanding power-plant developments of recent

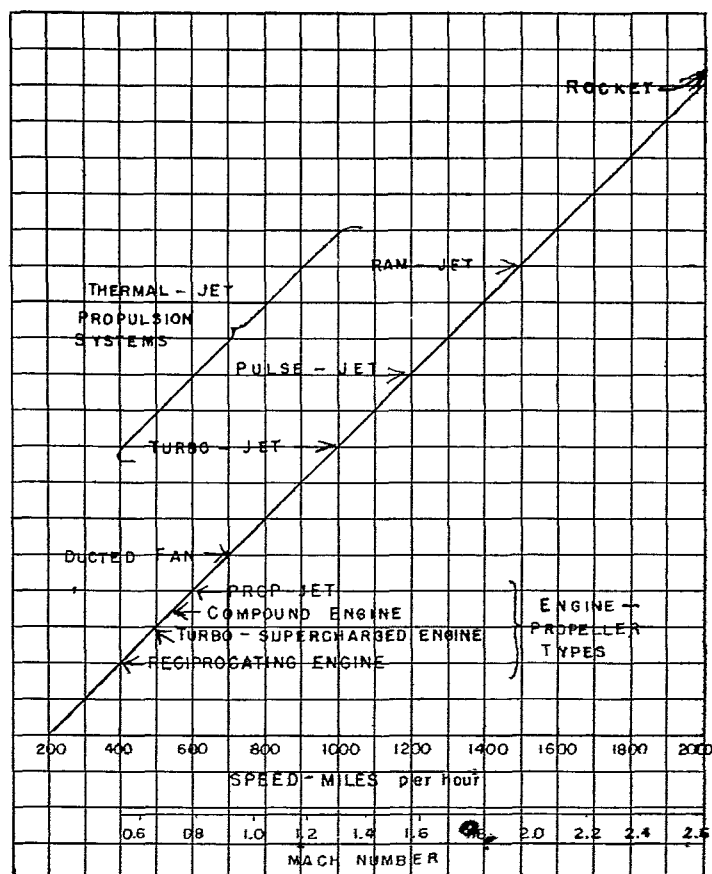


Figure 1—Maximum effective speed of aircraft power plants.

*Revised by the author from an article published in the July-August 1947 issue, COAST ARTILLERY JOURNAL.

times. Its fuel consumption is low at cruising and take-off powers.

It enables heavy, long-range aircraft to fly farther, faster and higher, to take off with heavier loads of cargo, fuel or bombs, and to climb faster.

The CHM2 two-stage turbosupercharger utilizes the engine's hot exhaust gases in two ways. The turbosupercharger first uses their energy to supercharge all combustion air required by the engine. It then discharges the gases to the rear through an orifice, the size of which is varied to obtain the best division of exhaust energy between supercharging and jet-thrust. Thus, the energy in the fuel is utilized to deliver power directly to a propeller shaft, to supercharge combustion air and to create jet-thrust.

Another "compounding" cycle under development is Wright Aeronautical Corporation's "Turbocyclone." In this configuration, the exhaust from the piston engine drives a gas turbine which delivers its power to the piston engine crankshaft through reducing gears.

The power plant for aircraft of the next higher maximum speed is the *aircraft gas turbine for propeller drive*, or more popularly known as the turbo-prop engine. This engine is a high-speed, turbine type, power plant driving a propeller through a reduction gear. Air is the working fluid and either kerosene or gasoline of any octane rating is the fuel. Combustion is a continuous flow process and is self-sustained after the power plant has been started. Ram air enters the compressor, is compressed, and passes into the combustion chambers where the gas temperature is increased by combustion of fuel. The hot gases from the combustion chambers expand through the turbine where power is developed to drive the compressor, the accessories and the propeller shaft. The energy remaining in the exhaust gases is utilized in a high velocity jet to produce additional propulsive thrust. The compressor for this engine can be of either the axial or radial flow type. Approximately 80% of the propulsive thrust is obtained from the propeller and the remainder from the jet exhaust. An airplane utilizing turbo-prop engines can obtain speeds approaching 600 miles per hour and again this may be increased when higher efficiency propellers at increased speeds are available.

To advance in speed beyond 600 miles per hour, aircraft must be powered by using some form of jet propulsion system. Jet propulsion systems embrace two main types, i.e., those using atmospheric air, called jets, and those not depending upon atmospheric air for combustion, called rockets. There are three main types of jets: *mechanical*, *auxiliary* and *thermal*.

A *mechanical* jet propulsion system may employ a reciprocating engine or a gas turbine for the prime mover. Forward thrust is obtained by means of an enclosed or *ducted fan* driven by the engine. A mechanical jet propulsion system may be designed to combine the air from the ducted fan with the higher velocity gas from the engine so as to augment or increase the velocity of the mixture.

Auxiliary jet propulsion has been referred to above in those power plant combinations which utilize the exhaust from a reciprocating engine or a turbosupercharger. Utilization of a greater percentage of the available energy in these auxiliary jet propulsion devices reduces the amount of power required from the propeller driven by the engine, particu-

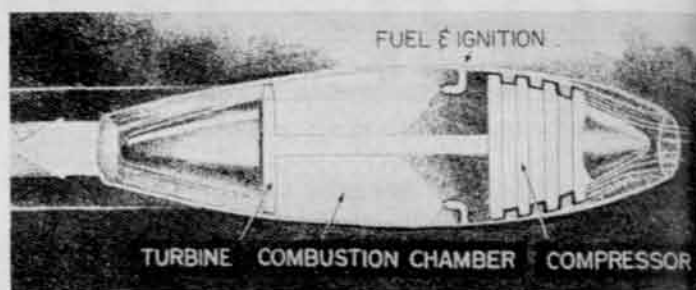


Figure 2—Turbo-Jet.

larly at higher altitudes, and will, therefore, result in an increase in speed.

Thermal jet propulsion includes four main types. These are the *Campini* system, *turbo-jet*, *aero pulse* and *athodyd*.

The "Campini" system utilizes a standard reciprocating aircraft engine to drive a compressor, whose air is then mixed with the exhaust from the reciprocating engine and fed to combustion chambers, where additional fuel is added. The resulting products of combustion are then directed through a nozzle which furnishes the high velocity jet. An airplane with a "Campini-type" power plant was first flown in Milan in 1940, but since this form of power plant was quite complicated in comparison with the turbo-jet, and no relative advantages over the turbo-jet were apparent, the project was not continued.

The *turbo-jet* is an aircraft engine which makes use of the thrust provided by a high velocity jet of gas from a suitably shaped jet nozzle. (See Figure 2.) As in the turbo-prop, air is the working fluid and either kerosene or gasoline is the fuel. Combustion is a continuous flow process and is self-sustained after the power plant has been brought up to starting speed and the fuel ignited by a spark plug, which is used in the starting cycle only. Ram air enters the compressor, is compressed, and passes into the combustion chambers, where its temperature is increased by the combustion of fuel. On expansion of the gas through the turbine, sufficient energy is extracted to drive the compressor. The energy remaining in the gas produces a high velocity jet. Thrust is the reaction to this high velocity discharge. The compressor can be of the radial type, or of the axial flow type.

The *aero pulse*, or *pulse jet*, which does not employ a mechanically driven compressor but depends upon its forward flight for compression, is best exemplified by the German V-1 "Buzz Bomb." This system employs a properly shaped cylinder with the diffusing air inlet periodically interrupted by shutters or valves, a fuel nozzle, a spark plug and a jet nozzle for discharging the high velocity exhaust. Since air is forced into the combustion space as a result of the forward motion of the aero pulse, it is necessary to launch this device before it will operate under its own power. Ignition is intermittent. The spark discharge explodes the fuel-air mixture, increasing the pressure in the combustion space, causing the inlet shutters to close and forcing the gas rearward through the jet nozzle. Release of the gas through the nozzle lowers the combustion space pressure below that on the forward side of the shutters, so that they open and admit air for the next cycle. Frequency of the explosions, which has a direct effect on speed, can be varied by spark discharge timing. The pulsating cycle is relatively inefficient.

The *athodyd*, or *aerothermodynamic duct*, popularly known as the *ram-jet*, is a cylinder with a diffusing air inlet and jet nozzle discharge. Fuel is supplied to the combustion space in the cylinder. After ignition, combustion is continuous. Compression of the air depends entirely upon forward motion of the athodyd through the air. The athodyd cannot be started from a static condition, but must have an initial velocity of approximately 350 miles per hour before sufficient net thrust is obtained for forward motion. The efficiency of the athodyd is very low until speeds of 800 miles per hour and above are reached. It is even simpler than the *aero pulse*, as there are no moving parts. An excellent description of the ram jet appeared in the January-February 1947 issue of THE COAST ARTILLERY JOURNAL.

Rockets which do not use air for combustion may be divided into four classes, depending on the type of fuel used. These are—*solid propellant*, *liquid propellant*, *gas propellant* and *mixed* or *combination* types.

The *solid propellant* rocket can be exemplified in its simplest form by the Fourth of July skyrocket in which gunpowder is the fuel. When ignited, the gunpowder burns and the resulting gas exhausts through a jet nozzle, thus developing the thrust.

Liquid propellant rockets employ various combinations, such as alcohol and oxygen, which are fed to the combustion chamber at high pressure, ignited and burned continuously. The products of combustion are directed through a jet nozzle.

Gas propellant rockets have not received much attention because of the difficulty in storing the gas. Operation of this type of rocket is similar to the liquid propellant type in that the gas is injected into the combustion chamber where it is ignited. Combustion is a continuous process, with the products of combustion being ejected through a jet nozzle.

The *mixed* type of rocket, as its name implies, may combine any combination of solid, liquid or gas for the propellant. The means of mixing and causing combustion varies with the combination of propellants used, but, as in other cases, the device consists of a fuel injector, a combustion chamber and a jet nozzle.

Now which types of aircraft should employ each of these kinds of engine? Obviously, there must be considerable overlapping. Speed, which is the main variable being considered here, is not the only criterion for selection of a power plant. In borderline cases, the choice will be influenced by many other factors. Operational economy has been considered in the choices listed.

Personal Aircraft

The simple reciprocating engine with, or without, a geared-driven supercharger is universally used at the present time on all personal aircraft. The privately owned airplane will undoubtedly, for many years to come, use this type of engine. The increased cost of the turbosupercharged or compound engine cannot be justified for the low use factor prevalent in this class of airplanes. The fuel economy of the large turbo-prop is poorer than that of comparable size reciprocating engines hence it is obvious that the small turbo-prop will be unable to compete with the commendable performance of existing piston engines in the personal plane size. Whether their lower specific weight, relative simplicity and

eventual attainment of longer life will offset the disadvantage of high fuel consumption remains to be seen. At any rate, there will be no major invasion of the turbo-prop in the low powered field for at least ten years.

The *turbo-jet* will not find ready application to the personal plane because its efficiency below 400 miles per hour is so poor as to make it uneconomical for this purpose. Speeds of 400 miles per hour and above will not be attractive to the great majority of private flyers.

Rockets, except for assist at take-off, are out of the question because of the high speeds involved in rocket powered aircraft and because of the extremely high fuel consumption.

Transports

Most transport airplanes in use on commercial airlines are powered by reciprocating engines with geared superchargers. Without pressurized cabins, there was no need to take advantage of the higher speeds offered at the higher altitudes. With the advent of the pressurized cabin, however, it is now possible to fly at 30,000 feet with complete comfort and safety for the passengers. In the Boeing "Stratocruiser," first commercial plane using turbosuperchargers, and soon to be in service with six of the world's major airlines, the turbosuperchargers play a triple role. In addition to supercharging the engine to maintain sea level power at high altitude, and assisting in power production by making use of the thrust from the turbo exhaust, it also furnishes air for pressurizing the cabin.

Certain advantages of the turbo-prop over the reciprocating engine will offset any disadvantage in fuel consumption, and ultimately will insure their use in certain applications, especially for engines of 1000 hp and above. The characteristics of the turbo-prop are such that it may be operated at very close to maximum power for its best specific fuel consumption. This, of course, allows continuous operation of the aircraft at the so-called cruising power at speeds approximately 100 miles per hour faster than is possible with reciprocating engines. The capacity of reciprocating engines has certain definite limitations, because of the difficulty of increasing the combustion volume beyond about 5,000 cubic inches without resorting to extreme complication in cylinder arrangement. Output per cubic inch can be increased by increasing engine back pressure and utilizing the exhaust gas in a turbosupercharger. Ultimate limitations to this scheme will also be found. On the other hand, the turbo-prop engine has no reasonable size limitation. The number of turbine and compressor stages and the diameter thereof can be increased well beyond any number and size now in existence. If required, a single turbo-prop power plant of 50,000 hp would not be an impossibility. It therefore appears that the most suitable field for exploitation of the turbo-prop is in sizes beyond that obtainable by a reciprocating engine. The lower limit in size should then be about 6,000 hp with the most attractive size for the next few years being about 10,000 hp.

Reciprocating engines, when used in combination with the turbosupercharger, offer performance economy up to at least 450 miles per hour, which cannot be matched by the turbo-prop. Problems of commercial flight at speeds higher than 450 miles per hour, not the least of which is discomfort upon encountering turbulent air at such speed, are being

analyzed most carefully by airline operators before deciding upon the use of higher speed transports.

If the desire is for increased speed, then why not take a real step? The turbo-prop makes possible "cruising" speeds equal to the maximum reciprocating-propeller engine speed of 450 miles per hour, but the turbo-jet allows operation in the 600 miles per hour class. For even reasonable comfort, the flights must be at 35,000 feet or more; but here again the turbo-jet is at its best at high speeds and such altitudes.

If the trend is toward super transports of 500,000 pounds gross weight or better, at speeds in the 500-mile class, and the desirable four-engine configuration is to be maintained, then turbo-props of about 25,000 hp would be in a class by themselves.

Rockets have been used for assisted take-off of transport planes and bombers of both land based and seaplane types. Increased use of this device is expected. Use of the rocket as the main power source for commercial airplanes will inevitably follow successful military exploitation but until the attainment of supersonic speeds with safety is assured, the commercial airlines will not be interested.

Military Aircraft

Now let us consider the military services who have supported the development of all these new types of aircraft power plants. At the end of World War II, production of aircraft was greatly reduced, but certain long-range bomber and fighter projects using the dependable *reciprocating engine and propeller* were continued. Notable in the bomber class are the six-engine Convair B-36 and the four-engine Boeing B-50. The North American F-82 fighter is outstanding because of its long range.

But for the air force of the future, the Air Force and the Navy are interested in the highest speeds possible, with reasonable consideration of range and maneuverability requirements. The turbo-jet is a power plant for high speed aircraft which has made possible the design of fighter and bomber types of aircraft which admirably fill Service requirements.



Figure 3—The Air Force's fastest jet bomber, Boeing XB-47.

How well the *turbo-jet* has been accepted can best be exemplified by a look at the newest Air Force planes now on procurement. In the fighter class there is only one airplane in the 80 to 90 series which uses the reciprocating engine-propeller combination.

The three 80 series fighters, for which there are sizable production orders, and which have received the most attention in the past year, are the Lockheed F-80 "Shooting Star," the Republic F-84 "Thunderjet," and the North American F-86. The flight by Colonel Council from Burbank, California to LaGuardia Field, New York on January 26, 1946 in 4 hours, 13 minutes, 26 seconds at an average speed of 586 miles per hour and overwater flights of more than 700 miles by several F-80 airplanes in the Pacific area indicate both the speed and reliability of this plane. North American's F-86 set a new official world speed record, 670.981 mph, in 1948.

The North American FJ-1, and the Douglas D558, are two of the high-speed additions to the Navy's jet-powered planes. The McDonnell FD-1 "Phantom" was the first pure jet plane to take off and land on a United States carrier. This event, which took place on July 21, 1946, proved that take-off and acceleration characteristics required for a wave-off were at least acceptable. More recent additions to the Navy's jet fighter force include McDonnell's F-2H "Banshee," Grumman's F-9F "Panther," and Chance-Vought's F-6U "Pirate" and F-7U "Cutlass."

Combination of propeller drive and turbo-jet in one airplane offers certain characteristics of special appeal to the Navy. The first such plane was the Ryan FR-1 "Fireball" with a reciprocating-propeller engine in the forward end and a turbo-jet in the aft end of the fuselage. Another version is the XF2R-1, with turbo-prop forward and a turbo-jet aft. The Glenn L. Martin XP4M-1 has two nacelles, each equipped with a reciprocating-propeller engine forward and a turbo-jet aft. Major claims for the combined power plant type are superior take-off and longer range, as compared with the all jet type. Long-range cruising is accomplished at most economical propeller engine speed with the turbo-jet inoperative.

The turbo-jet has invaded the bomber field and performance to date indicates that their use for this application is highly acceptable. The Douglas XB-43, North American B-45, Convair XB-46, Boeing XB-47, Martin XB-48 and Northrop YB-49 are all flying—establishing an entirely new conception of bomber operation. (See Figure 3.) These planes range in size from the medium to the heavy bomber class and the number of turbo-jets installed varies from two to eight. The nonstop, coast-to-coast flight of an XB-47 in 3 hours, 46 minutes, at an average speed of 607 mph, gives some indication of jet bomber speed possibilities.

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The *ram-jet* is suitable for the main power plant for ultra-high-speed pursuits, but such a ship would have to be launched from a catapult or a mother plane or take off with rockets or other power. Ram-jets for extra bursts of speed in combat would be feasible.

Rockets are the obvious answer for the highest speeds, so the development of rocket powered planes for military use is

under way. The first of these, the Bell X-1, is now flying and has exceeded the speed of sound, and others are on the way. Rockets have the advantage over the ram-jet of being able to take off under their own power.

The *helicopter* is a slow-speed aircraft, but the blade tips move at speeds which make the use of turbo-jets or ram-jets at their tips an attractive possibility. Dismemberment of the turbo-jet so that the main engine feeds compressed air to tip combustion chambers and jet nozzles at the tips of the wings making huge pin wheels would remove the complication of driving the rotor by means of a reciprocating engine or gas turbine. With an auxiliary starting means provided, ram-jets at the wing tips offer another possibility of simplifying helicopter power-plant installations.

As so much of the military air program and some of the future commercial air plans are dependent upon the aircraft *gas turbine*, it will be well to take a brief look at the short history of its development. In comparison with the time and the amount of work expended in developing and perfecting the reciprocating engine, the turbo-prop and the turbo-jet have had a relatively short existence.

Except for the pioneering work done by Group Captain Frank Whittle, there was no real concentration of effort on this program until 1940. Even spurred on because of the war, it would not have been possible to bring the various types of engines to their present state if it had not been for the work done in previous years on the various components of jet engines and on gas turbines for other than aircraft use.

Many of those in this country who were actively engaged in gas turbine work feel somewhat chagrined, for having all the components of a turbo-jet in their grasp, they did not assemble them into a jet engine at least as soon as the British and Germans did. However, with the background of experience in working with similar kinds of equipment, workers in this country were able to make rapid progress when the basic idea of jet propulsion was handed to them in the tangible form of the Whittle W1X engine. Independent development along this line was being pursued by several companies prior to receiving the Whittle engine, but the fact remains that those ideas had not progressed to the point where an engine was actually operating before the time the British engine was sent to this country.

The General Electric Company was assigned the task by the Army Air Forces in September 1941 of improving and placing into quantity production the Whittle W1X engine. Although the basic design of the Whittle engine was not altered, it was necessary to adapt it to American requirements and the resulting engine was known as the I-16 which powered the Bell P-59. This airplane, which first flew on October 2, 1942, has the distinction of being the pioneer in jet powered flight in this country. Even during attempts to get the I-16 into mass production while it was still in the development stage, it became evident that an engine of larger output would be required for a single engine pursuit airplane offering superior tactical characteristics. The General Electric I-40, or J-33, was next developed and is now being produced in considerable quantity by the Allison Division of General Motors Corporation for the Lockheed F-80 "Shooting Star," the Grumman F-9-F "Panther" and other military aircraft.

Paralleling the above program, General Electric also was

developing the TG-180, or J-35, turbo-jet engine and the TG-100, or T-31, turbo-prop engine. These two engines differed from the "I" types in that the compressor was of the axial flow rather than the radial or centrifugal variety. Much of the fundamental data upon which designs of the axial flow compressor were based were obtained from the original research conducted by the National Advisory Committee for Aeronautics at its Langley Field Laboratories in Virginia. Work on the axial flow type gas turbine was begun prior to receiving the Whittle engine, but its use was not specifically pointed toward aircraft propulsion at that time.

Entirely independent of any work being done by General Electric, the Westinghouse Electric & Manufacturing Company, under the sponsorship of the Navy Bureau of Aeronautics, developed and has in production the W-19B, or J-30 and the W-24C, or J-34. These turbo-jet engines are both of the axial flow type.

During the war period, the other of the three largest American electrical manufacturers in this country, Allis-Chalmers, undertook the manufacture of the British De-Havilland H-1 engine.

At the present time there are a dozen or more concerns engaged in the development of turbo-jet or turbo-prop engines. These companies, of course, include the three large reciprocating aircraft engine manufacturers, Allison Division of the General Motors Corporation, Pratt & Whitney Division of United Aircraft Corp. and Wright Aeronautical Corporation. Allison is producing J-33 and J-35 turbo-jets (formerly General Electric I-40 and TG-180) and Pratt & Whitney is producing JT-6 turbo-jets (an American version of the British Rolls-Royce "NENE").

Questions have recently been raised as to why the large electrical manufacturers rather than the large aircraft engine manufacturers were called upon by the Army and Navy to develop the aircraft gas turbine. Briefly, the problems of the aircraft gas turbine are far more closely associated with those encountered in the steam turbine than with those encountered in the reciprocating engine. Actually, the only point of similarity between the gas turbine and the reciprocating engine is that they are both installed in airplanes. The background of experience which the electrical manufacturers could draw upon as a result of many years of manufacture of the steam turbine has certainly been an important factor in bringing this program to its present state.

On top of these considerations of experience, it must be remembered that we were just entering a war, the duration and magnitude of which no one could predict. It was evident from the outset that it would be fought in or from the air. At that time all of this country's existing aircraft designs used the reciprocating engine, and it was imperative that Allison, Pratt & Whitney and Wright exert heroic efforts to meet our demands for production, as well as the demands which were placed on them by France and England. It was impossible at the time the decision had to be made for anyone to determine the usefulness of the jet or turbo-prop engine. It was a gamble which should be taken but which should not in any way interfere with the important work of improving and producing the reciprocating type engine.

The decision to place the responsibility for the development of turbo-jet engines with the electrical manufacturing companies rather than with the aircraft engine companies

was made and no one can deny, in the light of what has transpired, that it was a wise move for which the Services should be congratulated.

Progress which has been made to date in the development of turbo-jet engines should not obscure the fact that there are a great number of detailed design problems still to be solved. Further improvement of the turbo-jet depends upon development of new, or better ways of manufacturing the various components. Any major improvement to the turbo-jet will depend upon a new conception of design of one or more of the major components.

Turbo-jet designers have been continually treading on the heels of metallurgists in attempting to obtain alloys for turbine buckets, turbine nozzles, jet nozzles and combustion chambers which would withstand temperatures higher than those to which the engines are now limited.

In addition to being subjected to elevated temperatures, the aircraft gas turbine buckets must also withstand high centrifugal stresses. A considerable amount of information has been accumulated on the relation of stress, temperature and life of many existing alloys which were developed for this use. Information regarding resistance to fatigue, caused by bending due to gas impingement and also due to nodal vibration, is not complete but is being accumulated as rapidly as possible. Extensive tests on many high temperature alloys to determine the effect of grain size and means of preventing cracks due to thermal stresses are now under way.

Many of the difficulties now being experienced with turbo-jet engines can be traced to the problem of burning large amounts of fuel in a confined space. Heat release rates in the order of ten million b.t.u.'s per cubic foot per hour are not uncommon. Temperatures as high as 4000°F. are encountered in certain areas in the combustion space. For best efficiency, the combustion must be uniform and steady as any pulsation may induce vibration of nozzle blades or turbine buckets which will result in ultimate failure due to fatigue. The pressure drop of air and the resulting products of combustion into, through and out of the combustion chamber must be kept to a minimum. Combustion must be maintained over an exceedingly wide range of power from sea level to altitudes extending up to 50,000 feet or higher.

The use of multiple combustion chambers, resorted to in many designs, has certain advantages but it is important that the combustion in all chambers be equalized, so that there will be no variation in gas flow over the entire turbine nozzle ring. It is also essential that the gas leaving each combustion chamber should have a fairly uniform temperature over its entire cross section.

Complete combustion of the fuel is essential in order to prevent smoking, which in itself is not detrimental but is an indication of a reduction in combustion efficiency over that theoretically possible. The problem of completely mixing the fuel and air in a very small combustion space has been met by various means of whirling the air as it enters the combustion chambers, and also by introducing the air in proper portions throughout the length of the combustion chamber. Solving the smoking problem when using kerosene for fuel has presented far more difficulties than when using gasoline.

In attempting to mix the fuel and air completely, care must be exercised to prevent any local reduced pressure areas which will result in excessive carbon formation. Proper

placement of the spark plug for initial ignition has also been the subject of considerable research. Although the ignition is on only during the starting period, it is important that the spark plug itself be in a location where electrodes will not be subject to carbon formation or excessive temperatures. Relighting of the fuels following engine shutdown at altitude is more difficult than at sea level and for this reason it is highly important that the spark plug be in good condition.

The turbo-jet engine revolves at speeds in the order of 7,500 to 20,000 rpm, depending upon the size and type of design. Selection of bearings suitable for the compressor end, which is subjected to inlet temperatures of as low as minus 70°F., and the exhaust end as well as the mid-bearings which are surrounded by or close to combustion chambers or turbine nozzle boxes at temperatures of 1800°F. and higher, becomes a major design problem. Sleeve type bearings have not been satisfactory for this service so antifriction bearings of both ball and roller type have been used.

The antifriction bearing offers the advantage of lower starting power, which is a most important item during cold weather operation, and also the power loss at high speeds is relatively low. In addition, the lubricating oil requirement is only a small fraction of that for sleeve bearings. In fact, many turbo-jet engines have a self-contained oil system with no external storage tank, with no need for an oil cooler. As turbo-jet engines are installed in high speed airplanes, which in the case of pursuit ships are expected to engage in violent maneuvers, the bearings must withstand heavy precision loads.

The accessories for turbo-jet engines are entirely different from those used on reciprocating engines, and therefore the entire line has been subject to an intensive development program since the project was initiated.

The attention of all those engaged in the development of turbo-jet and turbo-prop engines is being focused on design problems. With their solution, will be born an aircraft engine embodying the characteristics of dependability and long life which have become the accepted standard of the reliable reciprocating engine.

And what about engines that will provide aircraft with speeds higher than those attainable by the turbo-jet? These are the pulse-jet, the ram-jet and the rocket. The turbo-jet has been successfully used for aircraft up to a Mach number of about .88. At sea level this corresponds to a speed of .88 x 763, or 670 miles per hour. The speed of sound at sea level is 763 miles per hour and reduces for increase in altitudes to about 660 miles per hour at 50,000 feet. Mach number is merely a convenient ratio of actual speed divided by the speed of sound at the particular condition being considered. The present world speed record of 670.981 miles per hour is not an indication of the highest speed a turbo-jet powered airplane can attain in level flight. Upon reaching the velocity of sound, air flow conditions over aerodynamic surfaces undergo a violent change in characteristics. Some portions of the aircraft are locally subject to the velocity of sound prior to the entire aircraft reaching that point. Increases in aircraft speed at the present time are not mainly dependent upon obtaining more power from the turbo-jet but, are rather upon designing an airframe structure suitable for higher Mach numbers. The problem of control and stability when approaching and passing through the transonic range is now

one of the major projects in the Air Force, Navy Bureau of Aerodynamics and the research laboratories of airframe manufacturers.

Figure 4 is an indication of the thrust required for a fighter airplane at various altitudes up to a Mach number of 2.4. In addition to showing the tremendous increase in thrust required at Mach numbers above 1.3, it is interesting to note that information on thrust required in the transonic range (Mach number range of 0.9 to 1.3) is rather meager. Extensive wind tunnel testing programs have provided data for speeds in the supersonic range so that the power requirements in this range are quite well known. The extreme difficulty in making wind tunnel measurements in the region where the air velocity approaches, reaches and goes above the speed of sound, has so far handicapped the accumulation of accurate data in this region. The accumulation of such data is now assisting in the design of aircraft to enter or cross the transonic region.

Turbo-jet engines for powers required in the supersonic range can be built. As it is not reliably known what power will be required to drive the airplane through the transonic region, it cannot be definitely stated that the turbo jet will be able to accomplish this. With a Mach number of about 1.5, the rise in temperature of the inlet air to the turbo-jet compressor will have reached a value of about 200°F. This introduces an extra design complication, and it is doubtful whether the use of turbo-jets much above such speeds is feasible. The use of exhaust reheat will raise the maximum speed at which turbo-jet units are useful. With this improvement it is doubtful whether the turbo-jet gas turbine will be competitive at Mach numbers above about 2. The rise in temperature presents no difficulty in the operation of the ram-jet and, of course, has no effect on rockets which do not use atmospheric air, so it would appear logical to consider either of these types for speeds above 1,000 miles per hour.

In addition to requiring more thrust for take-off because of its low speed thrust characteristic, it is obvious that extra bursts of power from the turbo-jet engine may be useful in entering and crossing the transonic range. This can be accomplished by injecting water and alcohol mixtures into the engine. Introducing this mixture into the compressor inlet provides a greater power increase than if it is injected into the combustion chambers but has the disadvantage of precluding the use of the air from the compressor for cabin supercharging. The present accepted method is to inject the mixture into the combustion chambers.

Another method of obtaining short time but large power increases is to burn additional fuel in the tailpipe just ahead of the jet nozzle. As the fuel air ratio of a turbo jet is quite high, there is sufficient air remaining in the turbine exhaust to support combustion if fuel is added in the tailpipe. The resulting thrust from the burning of fuel in the tailpipe is only about one half that obtainable from the fuel burned in the engine. It is possible to obtain thrust increases up to fifty per cent by this method.

A third means of increasing thrust for short periods of time, again at the expense of over-all fuel consumption, is to bleed some of the excess air from the compressor for use in an auxiliary combustion chamber which discharges its gas into the main tailpipe. As the same kind of fuel is used in this and also in the exhaust reheat system as is used in the

main portion of the engine, it is not necessary to predetermine the length of time available for booster operation for each flight. In the case of water alcohol injection, the augmentation is limited by stored liquid capacity.

With the requirement of extra take-off power met by one of the augmentation methods, there remains the problem of economical operation at low speed and low altitude and the improvement of accelerating characteristics in the event of wave-off or overshoot of the landing field. The latter is partially met by thrust augmentation if control devices can be devised to make the added thrust available instantaneously. Use of a variable area jet nozzle appears to offer the best solution to the acceleration problem, for it allows the engine to be operated at nearly full speed at reduced thrust. Decreasing the area of the variable jet nozzle will provide rapid increases in thrust. The variable jet nozzle, perhaps in combination with one of the thrust augmentation methods, should give satisfactory acceleration characteristics.

The poor economy of the turbo-jet at low speed and low altitude still is to be solved. The variable area jet nozzle is of some help, but leaves much to be desired. Awaiting the signal to land at a low visibility airport or circling for a landing on a carrier deck becomes a risky business with a thirsty turbo-jet gulping the last few gallons from the tanks. And what is the use of flying from Los Angeles to New York in four hours if an hour or more is wasted because of poor weather at destination?

The turbo-jet powered plane must land when it arrives. Until this can be assured, its usefulness for commercial operation is seriously handicapped. Installation of available all weather landing aids will remove this obstacle from general acceptance of the turbo-jet for airline service.

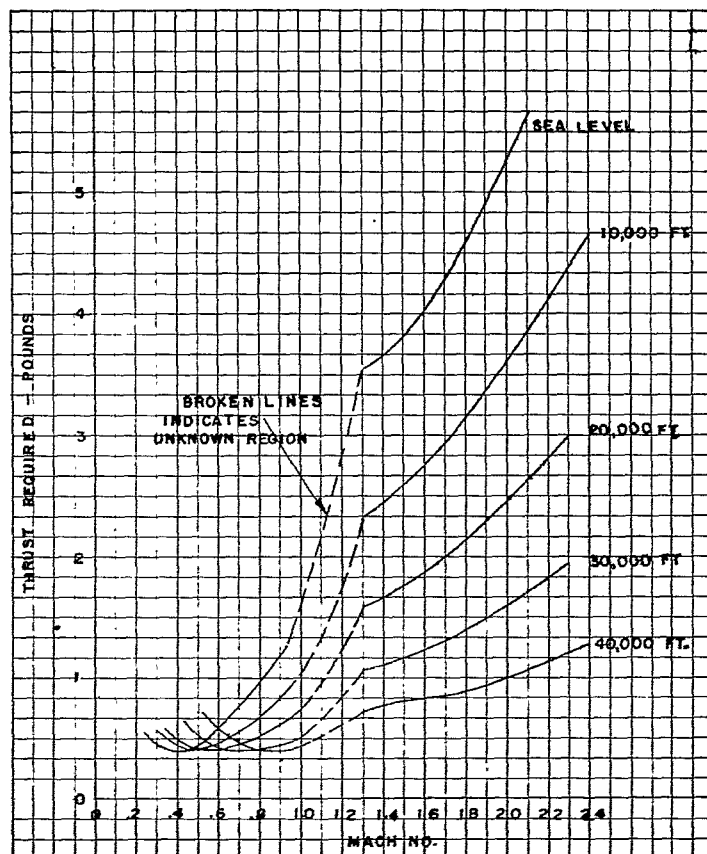


Figure 4—Thrust Required vs Mach Number.

When the Instrument Landing System, the Ground Control Approach, the fog dispersal system, the high intensity runway and approach lighting, and the control tower surveillance radar are in operation, safety of airline operation will be tremendously improved. They *must* be in operation before widespread use of turbo-jet planes becomes a reality.

Predictions should be avoided in a fast moving business like air transportation, but as it is a most intriguing sport, the author will also indulge.

To look ahead eight years may seem like a very long-range prediction, particularly when there is likelihood of a method of using nuclear energy for propulsion of aircraft being perfected within that period. Disregarding that possibility, here are the power plants for the 1957 model airplanes.

Small personal plane	Reciprocating engine	Medium range commercial	Turbosupercharged engine Few with Turbo-prop
Executive type or business plane	Reciprocating engine Small number with Turbo-prop	Long-range commercial (medium size)	Compound engine Some with Turbo-jet
Feeder line commercial	Reciprocating engine	Long-range commercial (large size)	Turbo-prop Compound engine Some with Turbo-jet
		Fighter	Turbo-jet Some with Rocket
		Interceptor	Turbo-jet + Rocket Some with Rocket
		Medium-range bomber	Turbo-jet
		Long-range bomber	Compound engine Larger sizes with Turbo-prop Few with Turbo-jet
		Missile or uninhabited aircraft Rocket	Ram-jet or Nuclear energy power plant



Army Announces Plan to Enlarge New Mexico Antiaircraft Range

The Department of the Army announced its plan to acquire on a rental basis 321,972 acres of land in New Mexico for use as an anti-aircraft range.

The area in question lies east of the Southern Pacific Railroad in the vicinity of Orogrande, New Mexico. It is proposed to acquire the area for use as an AA range incident to the expansion of the AA branch of the Army. Present plans call for its rental on a seven-day week basis, with the Army exercising complete control.

Original plans provided for Army use on a four-day week basis, the area to be open to ranchers on a co-use basis the remaining three days of the week. However, it is understood ranchers preferred to have the Army use it seven days a week rather than to attempt to conduct their operations on a 3-day basis.

The original AA range west of Southern Pacific Railroad and north of Fort Bliss will be utilized to full capacity in the expansion. This range is used for both AA and guided missiles.

SEACOAST SERVICE



TEST SECTION NOTES

COLONEL R. E. DINGEMAN, Coast Artillery Corps, Director

The months of April and May brought two anniversaries connected with the history of the Seacoast Service Test Section, Army Field Forces Board No. 1. April 5th was the one hundred twenty-fifth anniversary of the organization of the Artillery Board of Practice, the forerunner of variously named boards concerned with artillery matters. May 29th was the fortieth anniversary of the activation of the Coast Artillery Board, the predecessor of this section.

Since anniversaries bring to mind former years, the activities and comments of former years are interesting when considered in the light of modern times. Files of the Seacoast Service Test Section, which date back to the 1800's, contain the following historical records:

First JOURNAL "Notes": The first "Notes" were published in the July, 1922 edition of the COAST ARTILLERY JOURNAL by the Coast Artillery Board. Extracted from these first "Notes" are the following reports:

"The Board undertook some experiments in reference to application of duplex radio telephoning to Coast Defense service. The results of the test obtained to date are promising. Members of the Board have been able to communicate over post system (automatic) with the harbor boats in the bay."

"The Board has received samples of the modified Galitska panel. These are a clocklike arrangement of white on an orange ground or orange on a white ground, for use of communication between ground and Air Service. Experiments have been undertaken in conjunction with the Air Service to determine the efficiency of the panel."

The major portion of the first "Notes" was devoted to a report on a coincidence Target Computer intended to replace plotting boards. This was a device which reduced the triangles reproduced on plotting boards to their component parts and solved them by mechanical means and by use of an optical system similar to a coincidence range finder.

Artillery Memoranda and Notes: Prior to publication of the JOURNAL "Notes," the Artillery Board and later the Coast Artillery Board supervised publication of numbered Artillery Memoranda and Artillery Notes.

One of these Memoranda, dated 1906, contained an article titled, "Defense of Harbors by Fortifications," by Brigadier General R. F. Johnson, C.M.G., RA. The following quotations are extracted from that article:

"Defended harbors are, simply and solely, one of the means of carrying on naval warfare, and have nothing to do with the defense of sea frontiers, except in so far as they may serve as bases for the offensive action of a defending navy."

* * *

"Harbor defense and coast defense are two totally differ-

ent things. The latter, tactically offensive in its action, is concerned in resistance to invasion; the former, passive in its action, is one means of contributing to a nation's power to wage war beyond her coast line. Recognition of this fundamental truth is necessary for a correct appreciation of all points connected with the fortification of harbors, whether they be strategic or tactical."

* * *

"Some countries place their harbor defenses in the hands of their navies, and eminent authorities have said that the British navy should have charge of theirs."

* * *

"Some think that the army would be benefited by being relieved from the obligation of maintaining the garrisons of defended harbors abroad. But the presence of the regular troops is often wanted for other purposes than the defense of the harbors, and, as in wartime they can sooner or later be relieved by second-line forces, the garrisons really form a most valuable reserve of complete and fully trained units."

* * *

"Whether these views are right or wrong does not much matter because the answer to the proposal is really based on a principle of war of general application: all energies should be concentrated on what is most important. This makes it sound policy for continental nations, whose dependence for safeguarding their position is on their armies, to leave all means of naval warfare in the hands of their navies; but for an empire depending for its existence almost entirely on its navy, the same policy, however logical it may seem to superficial observation, would be radically bad, because it is incontestable that its navy should be relieved of any side issue in naval warfare which can be entrusted to its army, so that the former may be able to concentrate the whole of its energies on gaining and keeping the 'command of the sea.'"

Another of these Memoranda dated 1910, included an article on "The Evolution of the Submarine and How Far the Lake Type Solves the Problem," by Robert G. Skerrett.

By substitution of the word "airplane" for "battleship" and the words "guided missile" for "torpedo," the second paragraph of this article which reads, "The implements of offense with which modern mechanical cunning has equipped the battleship of today are sufficiently impressive to bear heavily upon the nerve of the fighting force against which they are pitted, and when to this stress is added the dread potentiality of the torpedo discharged from a hidden, mobile base, the submarine—as such—despite its unproved value in actual conflict, becomes an instrument of annihilation that must be reckoned with in the immediate future."

Artillery Notes No. 39½, dated 1916, reported an experimental 12-inch mortar practice in which aerial observation of fire was tested. In the conclusions and recommendations of the report it was stated that:

"The fact that in the whole Army and Navy combined but one hydroaeroplane was available for this experiment, and that not only could it not rise at all with two officers but even with the greatest difficulty with one, in spite of the well known efficiency of the aviator, Lieutenant Bellinger, USN, is a sad commentary on our aerial preparedness. It is indeed fortunate that Lieutenant Bellinger could get in the air on August 5 and demonstrate so skillfully what even one man could do in the matter of aerial observation of fire. It was really too much for one man to handle the aeroplane, keep out of the line of mortar fire, watch the water constantly for splashes, estimate the distance from the target, fire signals, and keep a record of his observations. Lieutenant Bellinger was very gallant in making the attempt and his success was indeed gratifying."

At one point in the test Lieutenant Bellinger's pencil was blown from his mouth by the wind and he could not complete his record of overs and shorts.

Projects: The oldest records on file in this section are those of the Torpedo Board. This board was appointed by the Chief of Engineers and was responsible for development of mine and torpedo systems. In 1901, functions of the board were transferred to the Artillery Corps.

The "Monthly Report of Operations for June 1898" of the Torpedo Board illustrates that advance ideas are not always welcomed. Among other papers considered at the meeting of the Board were:

"A Submarine Rocket proposed by Timothy Sullivan, Gunner's Mate, USN. Not Recommended."

"A letter from Jr. E. P. Arpin proposing that his torpedo be guided by means of the deflection of a galvanometer needle. He also proposed a number of powerful magnets on shipboard to pick up and carry away mines. It was directed that the letter be returned with the endorsement that the ideas presented were of no value to the service."

One particularly interesting project was the test firing at Fort Morgan, Alabama, 13 and 14 March 1916. In the first phase, the battleship *New York* was anchored 5800 yards from a disappearing battery and fired fifteen rounds from her 14-inch guns at the battery. One round hit in front of the BC station and theoretically killed the BC personnel. No other damage resulted.

The second phase consisted of the *New York* firing ten rounds at 8530 yards range. Nearest shot was 100 yards from the battery.

The battleship *Arkansas*, 12-inch guns, completed the test. The ship started at 20,000 yards and moved to within

16,000 yards of the battery firing thirty shots. One shot broke a concrete retaining wall but the battery suffered no other damage.

Some Historical Project "Mileposts"

First Artillery Board project of record is a study of gun commanders' range scales and tables, their uniformity, publication and distribution among Artillery Commands, which is dated 10 September 1900.

Last Artillery Board project was a test of Short Horizontal Base Range Finder, invented by John G. Hanks. Report thereon is dated 14 December 1908.

First Coast Artillery Board project, dated 11 December 1909, was a competitive test of azimuth instruments manufactured by Warner and Swasey Co., Baush and Lomb Optical Co., and Frankford Arsenal.

Coast Artillery Board project No. 1 entailed testing of high candlepower airplane flares and was completed 14 January 1924.

Last Coast Artillery Board project was No. 1274, service test of Navy Radar Indicating Equipment Model VG for use as a remote projection type PPI, dated 8 September 1945.

First Seacoast Service Test Section project, No. XSA-1264, dated 25 October 1945, was the service test of Gun Data Computer M8N to determine its suitability for use in the fire control system of 155mm M2 Gun batteries.

Current Projects

The projects for Seacoast Artillery firing by offset methods and the Remote Recording System for service and target practice firing are virtually complete.

An improved model of the Remote Recording System was built in the machine shop of this section. Using this improved system, several subcaliber 155mm offset target practices were fired. Results obtained with the recording system were excellent and the offset firing method has proven to be practical.

A service practice was conducted during the first week in May which completes work on these projects. Recommendations will be made on a production model of the Remote Recording System and an offset firing method.

Two new projects have been assigned. One is to determine whether the Navy Bell magneto telephone or the Army Signal Corps telephone TP-3 is more suitable for controlled submarine mine use than the present Standard Boat telephone. Plan of test for this project has been submitted for approval.

The other project is for service test of 120mm armament in a Seacoast Artillery role. Pending receipt of matériel, steps are being taken to obtain additional firing table data for horizontal fire with the M10 Director.





First tactical parachute drop by members of the 88th Airborne AA Battalion at Fort Bliss, Texas.

Defense Of A Landing Zone By An Airborne AA Battalion

By Lt. H. W. C. Furman

This problem was ably conducted by the 88th Airborne AA Battalion at Fort Bliss as a demonstration of the capabilities of this type of unit.—Editors.

Typical of many other AAA units, the 88th Airborne AA Battalion at Fort Bliss, Texas, was confronted with a training problem that required ingenuity to solve. Working on a very restricted schedule, the battalion S-3 had every hour filled and not a moment left for extra commitments.

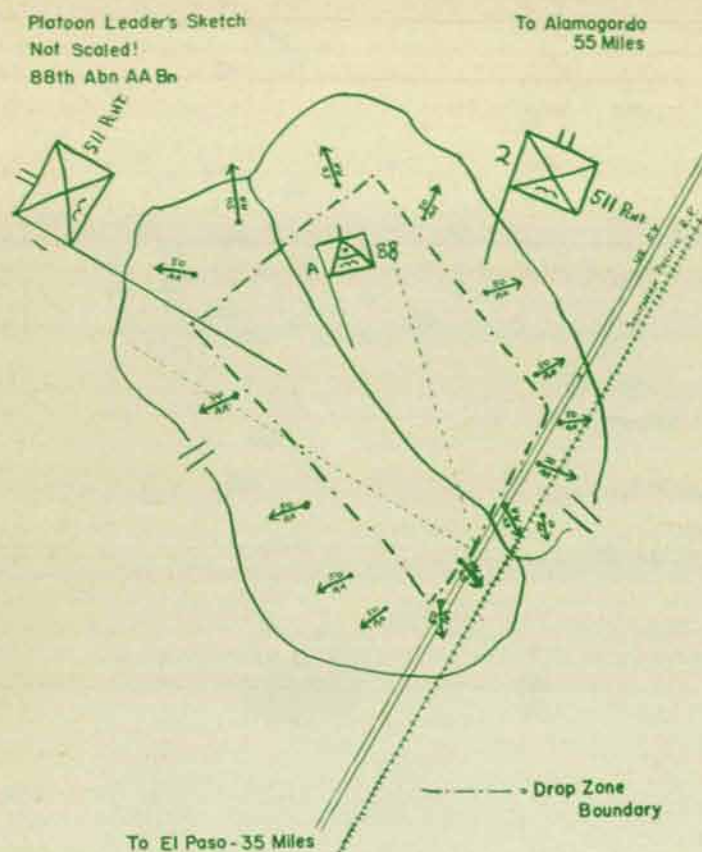
Early in April, word reached the battalion that an Army-wide inspection was in the offing and that the commanding general was interested in seeing the airborne unit in action. Desiring to make a good impression, and yet, with no time to take from training, Major Elmer W. Fox, the battalion commander and his S-3 were in a dilemma.

Because the Mobilization Training Plan for an airborne AA unit allowed a few hours of specialized parachutists' training, and because the newly arrived men of the outfit had never had an assembly problem, it was decided to work up a demonstration of a "landing zone" defense.

The considerations of the airborne unit were:

1. A jump was needed in order for the troopers to remain eligible for their hazardous duty pay. (One being required each three months.)
2. A graphic, short demonstration of training and equipment was desired for the general's inspection.
3. The newly arrived paratroopers needed an "assembly" type problem.
4. Other troops of the post had shown an interest in airborne tactics and wanted to see a practical demonstration.

The normal airborne division is equipped with only one



Schematic Sketch of Problem.

battalion of antiaircraft and this battalion has only two firing batteries of automatic weapons. In addition to their normal equipment of eight 40mm AA guns and eight M55 quadruple mount machine guns, each firing battery is armed with sixteen heavy barreled caliber .50 machine guns, on the near obsolete M-63 mount. In order to employ these pieces, they must naturally be at the scene of the battle, and with airborne troops the battle might move thirty miles away, overnight.

Until now, no method of successfully parachuting the 40mm or the M55 has been devised. These pieces must be brought to the scene of action by glider or powered transport aircraft. The caliber .50 machine guns on the M-63 mount, however, may be dropped into battle by means of the cargo type parachute and can be assembled and fired in a matter of minutes.

With these facts in mind, let us view the problem:

An enemy known as the "Aggressor Force" had invaded the southwest part of the United States, entering from already "conquered" Mexico. In their northern drive, Aggressor forces had driven across the Rio Grande and captured the city of El Paso, Texas, near Fort Bliss and Biggs Air Force Base. The next objective of the enemy was to move north, up the valley lying between the Hueco and Franklin Mountain ranges and to capture the rocket and atomic energy installations in New Mexico.

In an effort to prevent these vital plants from falling into Aggressor hands, the 11th Airborne Division was rushed to Alamogordo, New Mexico, and immediately launched a counter drive, utilizing the 511th Parachute Infantry Regiment.

Two battalions of infantry were dropped on the desert, and they engaged the enemy at once, cutting the Aggressor spearhead from its supply lines. The ground echelon of the division began attacking south and a small number of the Aggressors were being eliminated in this "pocket." The committed paratroops were unable to sustain themselves but for an extremely short time, being forced to live on what could be dropped to them. Water, especially, became a problem. Too, evacuation of wounded was impossible and the ammunition supply was critical.

The only solution to the infantrymen's plight was to establish a "landing zone" for gliders and the cargo ships. However, Air Force couldn't guarantee air superiority, a highly desirable factor, in airborne operations.

This was the situation as the 88th Airborne AA Battalion was called in. In order to safeguard the improvised landing zone, it would be necessary that a certain amount of antiaircraft be brought in.

Normal AAA tactics, according to FM 44-4, provide that a minimum of one battalion be assigned to the normal air landing strip and the same holds true for glider landing zones, according to the doctrines now taught at the AAA & GM School at Fort Bliss.

Utilizing a composite battery of heavy-barreled machine guns, the battalion commander ordered 16 of these pieces flown over the drop zone and dropped, with the members of the gun crew jumping with them. One hundred and fourteen crewmen, accompanied by six jump officers, poured from three C-82s after pushing out their bundles of guns and ammunition. One officer actually attached himself to his cargo bundles so that the assembly problem would be simpler.

Pathfinders had already sped into the designated area and were busy putting out varicolored smokes. Each color designated a specific assembly point for each gun section. The bundles of cargo came down from the clouds on different colored chutes, one color per gun section, and assembly was merely a matter of the crewmen dashing to their respective colors. Because of the natural spread of jumpers (due to the speed of the flying aircraft) the "dash" was quite a number of yards for some of the men.

The 120 AA men cleared their aircraft, with equipment, in a matter of 8 or 9 seconds and shortly thereafter were moving across the ground. Having jumped in the T-7 type trooper chute, equipped with a quick-release harness, the soldiers were able to drop their silk and be on the way as soon as they recovered from their parachute landing falls.

In order to coordinate the exit of all the men from the three separate planes, so that they would land in the proper area, the following orders were carried out. The battery commander acted as jumpmaster and flew in the lead plane. As soon as he found his drop zone, he led his group of men out. The officers in the two wing ships, flying a little to the rear of the lead plane, jumped the instant the first chute of the first plane began to open. This method concentrates the troopers into a relatively small area and makes assembly much less difficult. It, of course, adds to the traffic hazards in the air but the tactical advantage of quick assembly outweighs other considerations.

Flight Beyond the Earth's Atmosphere*

By Francis H. Clauser

For many years men have had their imagination fired by the thought of leaving the earth and voyaging to other members of our solar system. Until recently our technology had not advanced to a point where such proposals appeared feasible to hardheaded engineers. The advance of the last war, however, particularly the development of the V-2, showed that space travel may be nearer than many of us think.

After World War I, space-travel societies sprang up all over the world. For the most part their membership consisted of people with more enthusiasm than engineering skill. There was a sufficient number of skilled scientists and engineers, however, to establish the correct fundamental approach for the problem that lay ahead. Jules Verne's long-barreled cannon idea was abandoned as impractical. The rocket was seen to be the only power plant that was capable of producing enormous velocities out beyond the limit of the earth's atmosphere where air resistance and compression would not burn up a space vehicle.

In the late twenties and early thirties, rocket societies in both Europe and America were busily engaged in developing rockets for eventual use as power plants for space vehicles. After Hitler came to power, members of the German society became interested in building a missile for long-range bombardment. Their work was supported by the German Army beginning in the middle thirties and resulted in the development of the V-2's, which made London so uncomfortable in the last days of World War II.

Performance of V-2

From a purely engineering standpoint, the V-2's mark a very important stage in rocket development. The V-2 demonstrated that liquid fuel rockets can be successfully used to give considerably better specific thrust than solid propellant rockets. From a military standpoint, the V-2 suffered from the shortcoming that will always characterize high-performance rockets. It is necessary to expend a 12-ton vehicle in order to deliver one ton of pay load at the target. This seems to be the price it is necessary to pay for the advantage of the rocket power plant. We shall see that the price becomes even steeper as we ask more of the rocket power plant.

How far short of the goal of achieving the velocities necessary for space travel did the V-2 come? It will be remembered from college physics that if an object is projected out into space with a speed of 7 miles per second, or 25,000 mph it will travel out beyond the influence of the earth's gravitational field. The V-2 with its velocity of 4000 mph achieved about 16% of the required speed. Will it be possible to achieve the other 84%?

The velocity of the rocket exhaust cannot be arbitrarily selected by the designer. It is more strictly a characteristic of the propellants used, being determined to a large extent by the molecular weight, the temperature, and the specific heats of the combustion products. Other factors affect the exhaust

velocity so little that it is possible to state the exhaust velocity of a given rocket with reasonable accuracy solely from a knowledge of the propellants used.

The following table shows the exhaust velocities of some of the best-known rocket propellant combinations:

Exhaust velocities of Rocket Propellant Combinations

Propellants	Exhaust Velocity	
	F/s	Mph
Nitric acid and aniline	7,300	4980
Gasoline and liquid oxygen	8,070	5500
Alcohol and liquid oxygen	8,100	5520
Hydrogen and liquid oxygen	8,800	6000
Hydrazine and liquid fluorine	9,740	6630
Liquid hydrogen and liquid oxygen	12,000	8180
Liquid hydrogen and liquid ozone . .	13,150	8970

It is seen that liquid hydrogen-liquid oxygen and liquid hydrogen-liquid ozone have quite high exhaust velocities. However, the fact that liquid hydrogen has a low density, a low boiling point, and a low heat of vaporization makes pumping, piping, and storing extremely difficult. The high diffusivity of hydrogen makes sealing almost impossible. This, combined with the fact that hydrogen and oxygen are violently explosive in mixtures anywhere from 2 to 98%, makes them a dangerous combination, to say the least. The liquid ozone combination is even worse because liquid ozone occasionally detonates spontaneously. In order to overcome these difficulties, hydrogen-oxygen and hydrogen-ozone rockets will have to be unusually complex in their design, with a resulting penalty in structural weight.

To avoid such drawbacks, alcohol and liquid oxygen were used in the V-2. Even though these propellants have less exhaust velocity than liquid hydrogen-liquid oxygen, this is at least partially offset by the lower structural weight ratios possible.

At this point, let us return to the problem of launching a vehicle into interplanetary space. A velocity of 25,000 mph is 4.5 times the exhaust velocity of an alcohol-oxygen rocket and 3.1 times the exhaust velocity of a hydrogen-oxygen rocket. Such rockets would fall considerably short of producing the desired velocities. In fact, it would appear almost impossible to achieve the desired velocities.

In some ways this is a discouraging outlook; however, the encouraging fact is that rockets are able to produce velocities which are a large fraction of the desired velocity. It is logical to ask if there is some way of using rockets to obtain the remaining fractions of the required velocity. Earlier workers in the field saw that this was possible through the use of multistage rockets. To illustrate this concept let us consider a 2-stage rocket. We imagine our previously considered rocket being carried along as the "pay load" of a much larger rocket. The larger rocket is fired first and, when it has used up its propellants, it is discarded and the smaller rocket accelerates under its own power to even greater speeds.

*Reprinted from *Society of Automotive Engineers Quarterly Transactions*, October 1948.

A rocket with a larger number of stages is not always superior to a rocket with a lesser number of stages. If high performance is not demanded of a rocket: that is, if we do not ask for velocities of the vehicle that are comparable to or larger than the rocket exhaust velocity, then the single-stage rocket with its lack of multiple tanks, power plants, and so on, can be built with small over-all gross weight to transport a given pay load. However, when the required performance becomes sufficiently high, so that the single-stage rocket required to do the job would necessarily be larger compared to the pay load, then it is better to use a 2-stage rocket, with each stage sharing equally in producing the specified final velocity. If even greater performances are desired, then it is preferable to use successively a greater number of stages. It is interesting to observe that by using an ever greater number of stages, there is no upper limit to the velocity that can be attained.

Let us examine the feasibility of using multistage rockets to launch a vehicle into space at the escape velocity of 25,000 mph. It will be remembered that for alcohol-oxygen rockets the exhaust velocity is about 5520 mph and the ratio of vehicle velocity to exhaust velocity that is required for escape is 4.5. If we could build multistage alcohol-oxygen rockets where each stage would have a ratio of structural weight to the initial gross weight (S/W) of 0.15 and each stage would start with an initial acceleration of 2g, then a velocity ratio of 4.5 could be attained with a 6-stage vehicle weighing 22,500 pounds for each pound of pay load. For example, if we wished to have a 100-pound pay load, then the entire multistage vehicle, assembled, ready to be fired, would weigh approximately 2,250,000 pounds. This figure is, of course, forbiddingly large. The only comforting fact is that more than 80% of this gross weight is in propellants which are easier to manufacture than power plants, tanks, controls, and so on. We see the truth of a statement made previously that one of the inherent shortcomings of a rocket vehicle is the large gross weight that is required to transport a relatively small pay load, particularly when high performances are desired.

If we could build a hydrogen-oxygen multistage rocket with a ratio of structural weight to the gross weight (S/W) of 0.20 and with an initial acceleration of 2g, then the required velocity ratio of 3.1 could be obtained with a 5-stage vehicle weighing 2900 pounds per pound of pay load, or

290,000 pounds for a 100-pound pay load. This is a much more reasonable figure and could not be ruled out on the basis of size alone.

If the multistage hydrogen-oxygen rocket could be built with the same values of $S/W = 0.15$ and with an initial acceleration of 2g, as were used in the alcohol-oxygen rocket examples (a highly doubtful probability at present), then the required velocity ratio of 3.1 could be attained with a 4-stage vehicle weighing 1000 pounds per pound of pay load, or 100,000 pounds for a 100-pound pay load. This illustrates quite forcefully the advantages to be gained by increased rocket exhaust velocities.

It should be remembered that the above figures must be corrected for air resistance. Such a correction affects only the first-stage rocket in each case because the subsequent stages operate at altitudes well above the atmosphere. The experience with the V-2, which is comparable to that required for the first stage, indicates that the correction for air resistance is only a few per cent of the velocity; however, a few per cent change in velocity corresponds to much larger changes in gross weight.

From the above analysis, it is clear that a realistic appraisal of the problem shows that space travel is not just around the corner. It is most certainly going to have to await the development of high-velocity rockets with weights so low as to be difficult of attainment. It might be argued with a great deal of justification that existing power plants can do the job if we are willing to pay the heavy price in over-all weight that would be necessary. However, when we begin to compute the weights that are required if human beings are to be taken along as passengers, with adequate provision for their health and safety, the astronomical numbers that result surely rule out such projects. One cannot but agree with most of the serious writers in this field that space travel will come but that it will come by the gradual process of developing better sounding rockets, longer-range rocket missiles, and eventually undertaking the construction of satellite vehicles which will be the first embryonic space vehicles. When this experience lies behind us, we shall be in a position to consider the construction of a full-fledged spaceship, capable of leaving the earth's gravitational dominance. The time scale for such development is numbered in decades rather than in years.

Notify the JOURNAL your change of address.



News and Comment

Annual Financial Report

In accordance with the constitution of the Coast Artillery Association, the following annual statements of the Association and JOURNAL are published for the information of all Association members and subscribers.

These financial statements were accepted by the Executive Council of the Association at the annual meeting 11 April 1949.

ANTIAIRCRAFT JOURNAL BALANCE SHEET—DECEMBER 31, 1948 ASSETS

CURRENT ASSETS:

Cash on deposit	\$ 3,450.82	
Petty cash fund	25.00	
Accounts receivable:		
Merchandise accounts	\$ 2,570.91	
Subscriptions	373.50	
Army Times	1,200.00	
	<u>\$ 4,144.41</u>	
Less reserve for bad debts	384.20	3,760.21
Inventory of books		196.05

TOTAL CURRENT ASSETS \$ 7,432.08

FIXED ASSETS:

Office furniture and equipment	\$ 8,233.16	
Less reserve for depreciation	6,534.63	1,698.53

DEFERRED CHARGES AND OTHER ASSETS:

Inventory of office supplies	\$ 825.98	
Deposit with U. S. Government		
Printing Office	83.90	909.88

TOTAL ASSETS \$10,040.49

LIABILITIES AND NET WORTH

CURRENT LIABILITIES:

Accounts payable	\$ 1,287.18	
Credit balance, accounts receivable ..	269.23	

TOTAL CURRENT LIABILITIES... \$ 1,556.41

DEFERRED INCOME 5,148.59

NET WORTH:

Surplus balance, January 1, 1948 ...	\$ 7,343.59	
Deduct, net loss for the year ended		
December 31, 1948 per Exhibit B	4,003.10	
Balance, December 31, 1948		3,335.49

TOTAL LIABILITIES AND NET WORTH \$10,040.49

UNITED STATES COAST ARTILLERY ASSOCIATION BALANCE SHEET AS AT DECEMBER 31, 1948 ASSETS

Cash in bank	\$ 884.90	
Matured interest coupons	375.00	
Investments:		
U. S. Government bonds, Schedule		
1	\$69,410.63	
Common stock	160.00	69,570.63
TOTAL ASSETS		<u>\$70,830.53</u>

NET WORTH

Surplus balance, January 1, 1948 \$71,038.55

Less:

Excess of expenditures over receipts, per Exhibit B 208.02

SURPLUS BALANCE, DECEMBER 31, 1948... \$70,830.53

ID Card Approved For All Reserves Of Armed Forces

A standardized identification card for all personnel of the Civilian Components of the Armed Forces, not on extended active duty, has been approved by the Office of the Secretary of Defense. It will replace the various forms now issued by the Navy, Marine Corps and Coast Guard and also will be used by the Army and the Air Force.

The Army and Air Force, which hitherto have not issued identification cards to members of their Organized Reserve Corps and the National Guard, plan to begin issuance of the standardized cards about July 1, and to have it available for distribution in all areas by September 1, 1949.

The standardized card will be printed in two shades of red, with an engraved border. A modified Presidential Seal will be on the left side of the face of the card, and the seal, or insignia of the individual component on the right. The face of the card also will bear the signature of the person to whom it is issued, his grade, service number, and his return address.

The reverse side of the card will have the fingerprints of the individual to whom it is issued, and descriptive material concerning him, together with the number of the card and the date of issue.

Guard Strength Increased

National Guard Army and Air units have been authorized additional strength for the present (1949) fiscal year, Maj. Gen. Kenneth F. Cramer, Chief of the National Guard Bureau, recently announced.

The Army units of the National Guard were authorized an additional strength of 20,000 men; the Air Force an additional allotment of 4,324.

The previous budgetary limit was 300,000 for the Army and 41,000 for the Air units, for a total of 341,000. Incomplete State reports as of March 31, show a combined Army-Air Force National Guard strength of 342,027.

New War History Book To Be Released Soon

Guadalcanal: The First Offensive, is the title of volume two of the Army's combat history of World War II.

The volume, soon to be released, follows closely on the publication of *Okinawa: The Last Battle*, now in its second printing.

The Historical Division of the Army Special Staff reveals that three of the expected 90-volume history, covering all phases of World War II are now in print. Besides *Okinawa*, two volumes dealing with organization, training and procurement of the Army Ground Forces have been published.

Following *Guadalcanal* will come *The Lorraine Campaign*, scheduled for June release. In rapid succession will come the official Army histories of campaigns in the Mediterranean Theater, China-Burma-India Theater, the Persian Gulf Command, and other volumes in the Pacific and European Theaters.

Rocket Intercept

The U.S. guided missile program has developed to the stage where any bombing raid presently possible against an

American city, could be intercepted by aircraft-launched rockets that would seek out enemy planes and explode within lethal distance of them.

This and other disclosures relating to scientific weapons development, was made by Gen. Joseph T. McNarney, Chief of the Air Matériel Command, in a recent speech.

Four kinds of guided missiles are now under development, Gen. McNarney explained. They are: air-to-air; air-to-surface; surface-to-air; and surface-to-surface.

The latter he associated with so-called "push-button warfare," because the problem of guiding them accurately is so complicated as to delay their practical use until the "rather distant future."

Commissions

National Guard EM enrollment in Army 10-series courses has surpassed expectations, especially in ground arms. Warrant Officers and enlisted men in Guard now may get direct appointment as 2d Lieutenants if they: Are between 21 and 32 in age; have one year's service in Armed Forces, NG, or both, before date of appointment; have successfully completed Army 10-series extension courses; have received the recommendation of examining board for appointment or commission with waiver.

EM Promotion In Guard

"Qualification" and not time in grade should be basis for National Guard enlisted promotions, unit COs have been advised. If man is qualified, time is not deciding factor. Promotions to all grades may be made if T/O vacancy exists . . . Grade 5 and 6 promotions may be made in excess of T/O for qualified EM.

ORC Summer Training

Latest revised estimates (showing substantial increase over last year) indicate 50,090 Reservists will receive summer field training this year, a maximum of 15 days per unit. Combined training with RA and NG units has been planned in some instances. A majority of training to be conducted in 53 Army installations throughout the United States with Army Area commanders being responsible for detailed programs, Regular Army teams assisting in training. Training at many camp sites is to be conducted concurrently for ORC, NG and ROTC units. This means: More economical use of instructional teams, equipment, facilities and training aids. Provisions for training individual reservists at schools and with Regular Army and National Guard units also have been made.

ORC Pay

D/A Cir. 201, 1948, dealing generally with inactive-duty training and pay, has been amended by Sec. II, Cir. 50, 7 April '49, by adding para. 15.1 . . . as follows: "Pay periods—Army or territorial commanders, after consultation with State senior instructors and disbursing officers designated to make payment of inactive-duty training pay, will assign 3-month pay periods to all Organized Reserve Corps units within their respective areas. The pay periods assigned will be so distributed that approximately one-third of the Organized Reserve Corps will be paid at the end of each month. Submission of pay rolls covering one or two months as a

quarter to accomplish staggering of pay periods is authorized."

Two Reserve Officers Win Regular Army Commissions

Two reserve officers have won commissions as second lieutenants in the Regular Army after designation as Distinguished Graduates of the Army Ground Officer Candidate School, the Department of the Army announced.

Lieutenant Paul G. McCoy of 422 Conkey Street, Hammond, Indiana received his appointment in the Coast Artillery Corps and Lieutenant Richard T. Smock of 101 Schofield Circle, Fort Riley, Kansas was commissioned a second lieutenant in the Infantry. They are the first to obtain Regular Army commissions under this program. The selection is made on the basis of potential leadership ability and academic standing.

35,000 Vehicles Worth 60 Millions Put Into Shape By Guardsmen

Approximately 35,000 cargo and personnel transport vehicles with a value of about \$60,000,000 have been repaired or put into usable condition by the National Guard and are now being used in armory and field training.

The task was accomplished by personnel of the 61 National Guard State Maintenance Shops who are also members of the Guard.

Of 43,334 general purpose vehicles with a value at World War II prices of approximately \$78,007,249.00 delivered to the National Guard by the Army, a total of 34,583 valued at \$58,986,685.00 had been repaired and were in training use by National Guardsmen on March 1. The remainder is being put into shape.

The equipment was requested and accepted by the Guard in NRFI (not ready for issue) condition and ranged from new partially assembled vehicles in crates to World War II equipment in varying need of repair. This matériel was inspected prior to its acceptance.

National Guard Units Federally Recognized

The following National Guard units have been federally recognized since the last issue of the JOURNAL:

California:

Battery "D," 719th AAA Gun Battalion, Oakland.
Med. Det., 951st AAA AW Battalion, Richmond.

Indiana:

Battery A, 138th AAA AW Battalion, Huntington.
Battery "B," 138th AAA AW Battalion, Hartford City.

Kansas:

Headquarters & Headquarters Battery, 135th AAA AW Battalion, Hays.

Michigan:

Battery "A," 146th AAA AW Battalion, Detroit.

New York:

Battery "C," 336th AAA Gun Battalion, Utica.
Battery "D," 336th AAA Gun Battalion, Utica.

Ohio:

Battery C, 182d AAA Gun Battalion, Greenville.

Pennsylvania:

Battery "C," 337th AAA Gun Battalion, Hamburg.

South Carolina:

Med. Det., 678th AAA AW Battalion, Williamston.

COAST ARTILLERY ORDERS

DA and AFF Special Orders Covering the period March 1 through April 30, 1949. Promotions and Demotions not included.

COLONELS

Benitez, Enrique M., to Mil Staff Committee United Nations, New York, NY.
Dodge, Frederick B., Jr., to 5258th ASU Off Nebr Sr A Instr ORC, Omaha, Nebr.
Goodman, Sanford J., to US Army, Caribbean, Quarry Heights, CZ.
Grinder, Richard H., to Far East Comd, Yokohama, Japan.
Hindle, Clifford D., to 6601st ASU Calif NG Instr Gp, Sacramento, Calif.
Kahle, John F., to 2509th ASU District of Columbia NG Instr Det, Wash, DC.
Lepping, Aloysius J., to 4000th ASU Ft. Sam Houston, Tex.
McComsey, John A., to USMA, West Point, NY.
Ostenberg, Frank T., to OC of S, Wash, DC.
Pape, Robin B., to 4054th ASU AAA and GM Br, Ft. Bliss, Tex.
Pedicord, Everett D., to AFF, Ft. Monroe, Va.
Scott, Willard W., to US Army Alaska, Ft. Richardson, Alaska.
Turley, Robert E., Retired fr active Duty.
Wahle, Carl B., to 5426th ASU ROTC, Detroit High School, Detroit, Mich.
Walbridge, Vern, to Off NG Instr for NY 270 Broadway, NY.

LIEUTENANT COLONELS

Alfrey, John, to Far East Comd, Yokohama, Japan.
Andrews, Charles L., to Far East Comd, Yokohama, Japan.
Bane, John C., to OCAFF, Ft. Monroe, Va.
Barker, Wayne L., to Sixth Army 6404th ASU Army Rctg Sv, Seattle, Wash.
Bates, Raymond H., to Stu Det Hq Second Army, Ft. Geo. G. Meade, Md.
Boyce, Wilbur C., to 4051st ASU Stu Det Arty Sch, Ft. Sill, Okla.
Burrows, John E., to 4051st ASU Stu Det Arty Sch, Ft. Sill, Okla.
Cibotti, Philip R., to Stu Det Arty Sch, Ft. Sill, Okla.
Conell, Joseph C., to USMA, West Point, NY.
Corothers, Earl M., to Calif. NG Instr Gp, Sacramento, Calif.
Cromier, Everett L., to Office Sr Instr Gp, NG of Maine, Camp Keys, Me.
Curren, William F., to Hq Sixth Army, Presidio of San Francisco, Calif.
Dougan, Ramon C., to 3440th ASU Inf Sch, Ft. Benning, Ga.
Drew, Bernard J., to Hq Third Army, Ft. McPherson, Ga.
Drexel, Conrad G., to 4051st ASU Arty Sch, Ft. Sill, Okla.
Ebel, Henry W., to Stu Det Armed Forces Staff College, Norfolk, Va.
Franson, Paul O., to Fifth Army ASU Stu Det C&GSC, Ft. Leavenworth, Kans.
Foote, Seneca W., to C&GSC, Ft. Leavenworth, Kans.
Freund, John F., to 4055th ASU 1st GM Regt, Ft. Bliss, Tex.
Garbrino, Victor J., to Far East Comd, Yokohama, Japan.
Gerhardt, Harrison A., to Stu Det ICAF, Ft. Lesley J. McNair, Wash, DC.
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Hanson, Charles C., to 4054th ASU AAA and GM Br, Ft. Bliss, Tex.
Herrod, John T., to Arctic Test Br, OCAFF, Ft. Knox, Ky.
Hubbard, William H., to Hq First Army, Governors Island, NY.
Jones, Robert J., to Ryukyus Comd, Okinawa.
Kessler, Robert H., to 4054th ASU AA and GM Br, Ft. Bliss, Tex.

Kiel, Arthur C., to OC of S, Wash, DC.
Kopcsak, Arpad A., to Stu Det Sixth Army, Presidio of San Francisco, Calif.
Lagasse, Frederick J., to Far East Comd, Yokohama, Japan.
Laurenson, Stewart, to Far East Comd, Yokohama, Japan.
Lewis, Reece H., to Far East Comd, Yokohama, Japan.
Light, Everett D., to USMA, West Point, NY.
Lipscomb, Lafar, to Hq Sixth Army, Presidio of San Francisco, Calif.
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- Mitchell, Allan W., to Stu Det Armd Sch, Ft. Knox, Ky.
- Mize, Willard W., to Hq Army Security Agency, Wash. DC.
- Montrone, Alfred J., to Fifth Army ASU Stu Det C&GSC, Ft. Leavenworth, Kans.
- Moucha, Miroslav F., to CIC Cen, Cp Holabird, Md.
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- O'Brien, John A., to Second Army 2808th ASU Armd Sch, Ft. Knox, Ky.
- O'Connell, Francis J., to Hq First Army, Governors Island, NY.
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- Coiner, David T., to Off Food Admnr for Occupied Areas, Wash. DC.
- Conkle, John D., to Far East Comd, Yokohama, Japan.
- Copeland, Richard T., to Ryukyus Comd, Okinawa.
- Corby, Ralph F., to USAFI, Madison, Wisc.
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 O'Donohue, Thomas J., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
 Okert, Fred H., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
 Paddenburg, John A., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.

Pallman, George H., to Far East Comd, Yokohama, Japan.
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 Rawcliffe, William, to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
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 Rice, Freeman D., to AA&GM Br TAS, Ft. Bliss, Tex.
 Rumpf, Edward J., to Stu Det Arty Cen, Ft. Sill, Okla.
 Rutherford, Robert D., to Stu Det Arty Cen, Ft. Sill, Okla.
 Schwyn, James M., to Hq ASAE, Frankfurt, Germany.
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 Skipper John D., to Stu Det Arty Cen, Ft. Sill, Okla.
 Smith, James L., Jr., to 6004th ASU, Ft. MacArthur, Calif.
 Snow, James A., to Far East Comd, Yokohama, Japan.
 Snow, Frank G., to 112th CIC Det, Ft. Sam Houston, Tex.
 Spencer, Thomas K., to 6004th ASU, Ft. MacArthur, Calif.
 Stachelski, Alexander C., to AA&GM Br TAS, Ft. Bliss, Tex.
 Sukiennik, Stacy J., to Far East Comd, Yokohama, Japan.
 Swanwick, Joseph P., to US Army Caribbean, Quarry Heights, CZ.
 Sydnor, William D., to Stu Det Arty Cen, Ft. Sill, Okla.
 Thaxton, Halbert C., to US Army Caribbean, Quarry Heights, CZ.
 Thies, Lawrence H., to US Army Alaska, Ft. Richardson, Alaska.
 Touart, Anthony J., to The Arty Sch, Ft. Sill, Okla.
 Touns, Joseph D., to AA&GM Br TAS, Ft. Bliss, Tex.
 Trice, William A., Jr., to AA&GM Br TAS, Ft. Bliss, Tex.
 Trussell, Albert R., to Far East Comd, Yokohama, Japan.
 Vaughn, Milton S., to AA&GM Br TAS, Ft. Bliss, Tex.
 Versa, Salvatore J., to US Army Caribbean, Quarry Heights, CZ.
 Walker, J. Leroy, to AA&GM Br TAS, Ft. Bliss, Tex.
 Waters, Fred D., to Far East Comd, Yokohama, Japan.
 Watson, Johnny J., to Arctic Test Br OCAFF, Ft. Knox, Ky.
 Wickert, Howard T., to Stu Det Arty Cen, Ft. Sill, Okla.
 Williamson, Robert H., Jr., to Stu Det Arty Cen, Ft. Sill, Okla.
 Willis, Jean P., to Arty Sch, Ft. Sill, Okla.
 Wilson, Charles A., to 1st GM Regt, Ft. Bliss, Tex.
 Woods, James R., to Stu Det Arty Cen, Ft. Sill, Okla.
 Yantis, Myron D., to Stu Det Arty Cen, Ft. Sill, Okla.
 Young, Ralph E., to Stu Det Arty Cen, Ft. Sill, Okla.

Zaldo, William T., to AA&GM Br TAS, Ft. Bliss, Tex.

FIRST LIEUTENANTS

Alexander, Joseph B., to Far East Comd, Yokohama, Japan.
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 Amlong, Thomas E., to Far East Comd, Yokohama, Japan.
 Anderson, Richard C., to Far East Comd, Yokohama, Japan.
 Anderson, William R., Jr., to Far East Comd, Yokohama, Japan.
 Balsley, Kenneth R., to AA&GM Br TAS, Ft. Bliss, Tex.
 Barnard, Bruce McC., Jr., to Far East Comd, Yokohama, Japan.
 Beckett, James E., to AA&GM Br TAS, Ft. Bliss, Tex.
 Becknell, Robert G., to AA&GM Br TAS, Ft. Bliss, Tex.
 Brabec, Robert, to AA&GM Br TAS, Ft. Bliss, Tex.
 Bratina, Ily, Separation from service.
 Carey, James O., to AA&GM Br TAS, Ft. Bliss, Tex.
 Cavanna, Augustus R., Jr., to Stu Det Arty Cen, Ft. Sill, Okla.
 Dallacqua, Mario R., to 2327th ASU, Wilmington, Del.
 Dolan, Thomas M., to Stu Det Arty Cen, Ft. Sill, Okla.
 Downing, Roland E., to US Army Alaska, Ft. Richardson, Alaska.
 Doxey, Maynard E., to US Army Alaska, Ft. Richardson, Alaska.
 Doyle, Arthur, Jr., to 1st GM Regt, Ft. Bliss, Tex.
 Duckworth, Phillip B., to AA&GM Cent, Ft. Bliss, Tex.
 Evans, Daniel, to AA&GM Cen, Ft. Bliss, Tex.
 Fischer, Kenneth P., to Stu Det Arty Cen, Ft. Sill, Okla.
 Frick, Edwin J., to Ryukyus Comd, Okinawa.
 Gadowell, Frederick A., to 10th Inf Div, Ft. Riley, Kans.
 Gage, Joseph M., to AA&GM Cen, Ft. Bliss, Tex.
 Garvey, Daniel J., to Far East Comd, Yokohama, Japan.
 Goodwin, Henry C., to US Army Caribbean, Quarry Heights, CZ.
 Halliwell, Warren L., to Arctic Test Br OCAFF, Ft. Knox, Ky.
 Hayden, James L., to AA&GM Br TAS, Ft. Bliss, Tex.
 Hereth, Raymond J., to Far East Comd, Yokohama, Japan.
 Herold, Gerald McF., to Far East Comd, Yokohama, Japan.
 Hiley, Julian, to AA&GM Br TAS, Ft. Bliss, Tex.
 Hill, Elliot B., to Far East Comd, Yokohama, Japan.
 Hogan, Robert L., to AA&GM Br TAS, Ft. Bliss, Tex.
 Hosemann, Joseph F., to AA&GM Br TAS, Ft. Bliss, Tex.
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 Johnston, Francis I., to AA&GM Br TAS, Ft. Bliss, Tex.
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 Lahey, George J., to AA&GM Br TAS, Ft. Bliss, Tex.
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 Lee, Claude F., to Far East Comd, Yokohama, Japan.
 Long, Wesley T., to Ryukyus Comd, Okinawa.
 McNamee, Roland W., Jr., to Hq Second Army, Ft. George G. Meade, Md.
 MacHott, Hyman E., to Far East Comd, Yokohama, Japan.
 Magruder, Virgil E., to AA&GM Br TAS, Ft. Bliss, Tex.
 Mahon, Russell P., to Far East Comd, Yokohama, Japan.
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Mendenhall, Clarence M., to AA&GM Br TAS, Ft. Bliss, Tex.
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 Moore, Wayne D., to Ryukyus Comd, Okinawa.
 Myers, Robert D., to Far East Comd, Yokohama, Japan.
 O'Day, Thomas H., to Far East Comd, Yokohama, Japan.
 O'Donnell, Neil J., to AA&GM Br TAS, Ft. Bliss, Tex.
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 Pierce, Lester W., to Far East Comd, Yokohama, Japan.
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 Raperto, Ralph B., to AA&GM Br TAS, Ft. Bliss, Tex.
 Reidy, William J., to AA&GM Br TAS, Ft. Bliss, Tex.
 Riley, James L., to Ryukyus Comd, Okinawa.
 Ringer, John E., to Far East Comd, Yokohama, Japan.
 Salesby, Claude, to Far East Comd, Yokohama, Japan.
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 Scarborough, Samuel, to AA&GM Br TAS, Ft. Bliss, Tex.
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 Waring, Robert C., to Far East Comd, Yokohama, Japan.
 Washbourne, Kyle V., to SB TAS, Ft. Winfield Scott, Calif.
 Weyant, Wallace W., to AA&GM Br TAS, Ft. Bliss, Tex.
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 Zoladg, Alfred E., to 4052d ASU, Ft. Bliss, Tex.

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Blankenship, Alan W., to Grnd Gen Sch, Ft. Riley, Kans.
 Boisvert, George A., to 4052d ASU, Ft. Bliss, Tex.
 Churchill, Lake G., to Far East Comd, Yokohama, Japan.
 Graham, Douglas M., to US Army Forces Antilles, San Juan, PR.
 Grammer, William C., to US Army Alaska, Ft. Richardson, Alaska.
 Grimes, John R., to Far East Comd, Yokohama, Japan.
 Harrington, Lonnie E., to Far East Comd, Yokohama, Japan.
 Harrison, Walter R., to Far East Comd, Yokohama, Japan.
 Howell, Ted W., to US Army Alaska, Ft. Richardson, Alaska.
 Jones, John W., Jr., to Far East Comd, Yokohama, Japan.
 Kelley, Martin J., to 4052d ASU, Ft. Bliss, Tex.
 Kirkpatrick, William M., to RYCOM, Okinawa.
 Lancaster, Arthur E., to 503d Abn AA Bn, Ft. Bragg, NC.
 Littlejohn, John C., to Far East Comd, Yokohama, Japan.
 McClafflin, Frank L., to Far East Comd, Yokohama, Japan.
 Morgan, John G., to 4052d ASU, Ft. Bliss, Tex.
 Stevens, Byron L., to Far East Comd, Yokohama, Japan.
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Lt. Col. Richard G. Thomas, CAC, was commissioned in the Infantry in 1936 and was transferred to the CAC in 1940. During the war he was detailed in GSC. Since August 1947 he has been Assistant Director of the Guided Missile Department, AA & GM Branch, TAS, Fort Bliss, Texas.

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Col. J. C. Fry is a graduate of the United States Military

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Col. Homer Case served during World War II as the first A.C. of S., G-2, ETO, and then in command of the 32d Antiaircraft Brigade which supported the Sixth Army in its long drive from New Guinea to the Philippines. Since the war he has served with the Development Section, Army Ground Forces and as Artillery Officer, Sixth Army. At present he is with the Personnel and Administration Division, Department of the Army.

Lt. Col. Howard B. Hudiburg, GSC, is assigned to the Air Requirements Section, Research and Development Group, Logistics Division, General Staff, United States Army. During World War II, he was Executive of the 31st AAA Group with the First Army and the IX Air Defense Command in Europe.

A native of South Carolina, Lt. H. W. C. Furman graduated from The Citadel, The Military College of South Carolina, in 1943. He entered the Infantry School at Fort Benning and was commissioned Second Lt. in 1944. He served in the European Theater where he was wounded.

Commissioned in the Regular Army in 1946, in Coast Artillery, he qualified as a parachutist and gliderman. He is now with the 88th Airborne AA Battalion, at Fort Bliss.

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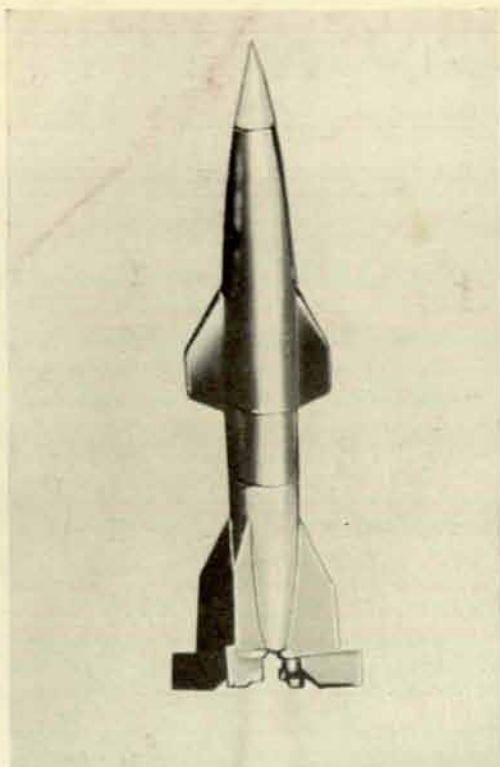
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